This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
Q124 .B99 1870 STOR
A Treatise on the theory and practice of
24503345161

Dr. E. S. O'Brien,

834 Mission St.

LANE

MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY

1885

Gift of

Dr. E. S. O'Brien

E. S. O'Brien
1877

A TREATISE

ON THE

THEORY AND PRACTICE

OF

OBSTETRICS.

BY

WM. H. BYFORD, A.M., M.D.,

PROFESSOR OF OBSTETRICS AND DISEASES OF WOMEN AND CHILDREN IN THE CHICAGO MEDICAL COLLEGE, ETC., ETC., AUTHOR OF THE PRACTICE OF MEDICINE AND SURGERY APPLIED TO THE DISEASES AND ACCIDENTS INCIDENT TO WOMEN, CHRONIC INFLAMMATION OF THE UNIMPREGNATED UTERUS, ETC., ETC.

LANE [illegible]

NEW YORK:
WILLIAM WOOD & CO, 61 WALKER STREET.
1870.

NP

Entered according to Act of Congress, in the year 1870, by
WILLIAM WOOD & COMPANY,
In the Clerk's Office of the District Court of the United States for the Southern District of New York.

The New York Printing Company,
81, 83, *and* 85 *Centre Street*,
New York.

99
870

PREFACE.

OBSTETRICS has become an extensive branch of our profession, and almost all the recent works upon the subject are ponderous volumes. The excellent treatises of Hodge, Meigs, and Bedford, of America; Cazeaux and Joulin, of France; and Ramsbotham, of England, are all so many monuments of the learning and skill of their authors. I mention these in particular, because at the present time they are the most popular books on obstetric medicine and surgery; but there are many others of great value to be found in the library of all intelligent obstetric practitioners. In the course of his teaching, for many years the author has been convinced that a treatise much more concise than any of these could be made to contain all the practical information necessary to guide the student and "busy practitioner" in the acquirement and exercise of this important branch of our art, and it is with the hope of accomplishing this desirable object that the present work has been undertaken. Extensive discussions of disputed points of doctrine, or minute research, or copious and frequent quotations of authors, are incompatible with conciseness and comprehensiveness, and consequently have been avoided; while the author has endeavored to take a straightforward course in the accomplishment of his object. It is hoped that while this work is concise, it will be found to be comprehensive and complete, and to contain in perspicuous detail all that is regarded as practically valuable at the present time. In lieu of the fre-

32985

quent mention of authorities for statements made in the text, the author subjoins a list of the works and periodicals he has had occasion to consult:—Montgomery's Obstetrical Essays, Burns' Principles of Midwifery, Simpson's Obstetric Memoirs and Contributions, Churchill's System of Midwifery, Churchill's Operative Midwifery, Robert Lee's Theory and Practice of Midwifery, the same author on Operative Midwifery, Blundel's Principles and Practice of Midwifery, Gooch's Practical Compendium of Midwifery, Collins' Practical Treatise on Midwifery, Rigby's System of Midwifery, Alexander Hamilton's Theory and Practice of Midwifery, Beatty's Contributions to Medicine and Midwifery, Denman's Practice of Midwifery, Dublin Practice of Midwifery, Smellie's Theory and Practice of Midwifery, Tyler Smith's Principles and Practice of Obstetrics, Davis's Principles of Obstetric Medicine, Ramsbotham's Obstetrics, Tilton's Menstruation, Whitehead on Abortion, Savage's Anatomy of Pelvic Viscera, Playfair's Operative Obstetrics, Priestley on Pelvic Fascia, Greenhalgh's Placenta Prævia, Transactions of London Obstetrical Society, and London Lancet.

Among the French authors consulted are Maygrier, Baudelocque, Mad. Boivin, Moreau, Mad. La Chapelle, Velpeau, Joulin, Cazeaux (Translation), Chailly (Translation), Raciborski on Menstruation, Gazette Hebdomadaire, Archives Générales de Médecine.

The German are Naegele, Lehrbuch der Geburtshilfe, Scanzoni, and Martin.

To Meigs, Miller, Dewees, Bedford, Hodge, and Elliot, American authors of proud distinction, I am indebted for much valuable information. The Transactions of the American Medical Association, New York State Medical Society, Indiana Medical Society, Illinois State Medical Society, The American Medical Journal, New York Medical Journal, Medical Record, Medical and Surgical Reporter, Boston Medical and Surgical Journal, Richmond and Louisville Medical Journal, Cincinnati Lancet and Observer, Buffalo Medical Journal, Obstetric Journal, Journal of the Gynecological Society, Half-Yearly Compendium of the Medical Sciences, Rankin's Abstract, Braithwaite's Retrospect, and many other periodicals have been consulted. The author acknowledges much aid derived from many excellent papers received from the authors, among which deserving especial mention are Professor Logan's Report to the State Medical Society of Michigan, and Dr. Rogers' Report of Transactions of the American Medical Association on Extra-uterine Gestation.

CONTENTS.

PAGE

THE PELVIS ... 1

THE FŒTAL HEAD ... 10

PELVIMETERS ... 14

FEMALE ORGANS OF GENERATION ... 25

THE VAGINA ... 30

THE UTERUS ... 32

OVARIA ... 42

GENERATION ... 52

CHANGES IN THE OVUM ... 72

SYMPTOMS OF PREGNANCY ... 96

DURATION OF GESTATION ... 118

MULTIPLE PREGNANCY ... 119

SUPERFŒTATION ... 123

GENERAL PATHOLOGY AND THERAPEUTICS OF PREGNANCY ... 124

EXTRA-UTERINE PREGNANCY ... 135

MOLE PREGNANCY—BLIGHTED OVA ... 145

DISPLACEMENTS OF THE UTERUS DURING PREGNANCY ... 149

ABORTION—MISCARRIAGE ... 155

LABOR ... 176

FACE PRESENTATIONS ... 195

BREECH, KNEES, AND FEET PRESENTATIONS ... 199

DIAGNOSIS OF LABOR ... 203

DIAGNOSIS OF FACE PRESENTATIONS ... 212

DIAGNOSIS IN THE THIRD STAGE OF LABOR ... 214

PROGNOSIS CONNECTED WITH NATURAL LABOR ... 215

MANAGEMENT OF NATURAL LABOR ... 220

MANAGEMENT OF FACE PRESENTATIONS ... 227

MANAGEMENT OF BREECH, FEET, AND KNEE PRESENTATIONS ... 228

ANÆSTHETICS IN LABOR ... 231

NATURAL LABOR IN MULTIPLE CASES ... 235

ATTENTIONS TO THE CHILD ... 236

APNŒA ... 240

PAGE

PUERPERAL CONDITION.. 245
AFTER-PAINS.. 248
MANAGEMENT OF THE PUERPERAL CONDITION.................. 249
MANAGEMENT OF THE BREASTS.............................. 255

DIFFICULT LABORS... 279
DIFFICULTIES REQUIRING INSTRUMENTAL DELIVERY........... 305
EMBRYOTOMY... 335
TURNING IN CONTRACTED PELVIS........................... 348
LABOR RENDERED DIFFICULT BY PRETERNATURAL PRESENTATIONS... 349
INDUCTION OF PREMATURE LABOR........................... 372
GASTROTOMY—CÆSAREAN SECTION............................ 377
DIFFICULT LABOR FROM COMPLICATIONS..................... 383

HEMORRHAGE AFTER EXPULSION OF THE FŒTUS.................... 411
INVERSION OF THE UTERUS COMPLICATING LABOR................. 420
RUPTURE OF THE UTERUS...................................... 426
PROLAPSE OF THE CORD....................................... 432
PUERPERAL CONVULSIONS...................................... 438

THEORY AND PRACTICE OF OBSTETRICS.

PELVIS.

As the study of the particular bones of the pelvis, their relations, mode of junction, and ligaments, is the same in the male and female subjects, I presume my readers are familiar with them, hence do not consider it necessary to enter into a minute description of them, and will begin by describing the pelvis in its obstetric relations more especially. Situated in the centre of the human frame, it serves as the base of support for the trunk above, and is sustained by the legs below. This circumstance is the cause of some of the deformities to which it is subject, as well as embarrassing displacements of position. In the fœtus and early childhood it is much narrower and deeper, proportionately, than in after life, and most of its adult viscera are above instead of within its cavity. The female pelvis differs from the male in many important particulars. The bones are lighter and smoother, their edges more rounded, and their angles less sharp and prominent. The cavity not so deep, but broader and more capacious. The curve in the sacrum of the female pelvis begins below its middle, while that of the male commences at the promontory. The arch of the symphysis of the male pubis is angular; that of the female more rounded, and the rami of the pubis and ischium on either side flare outward in such a regular manner as to suggest the idea that they had been moulded upon a round body, and which very much facilitates the passage of the fœtus between them.

Very properly, writers describe the pelvis as being made of two parts: One, sometimes called the false pelvis, formed by the expanded wings of the iliac bones, and deficient in front of bony structure, but filled up by the lower portion of the abdominal muscles. But little interest attaches to this in an obstetrical point of view. The second part has been aptly named the true pelvis.

It is of great importance that this true pelvis, or the pelvic excavation, should be well understood by the accoucheur. When we look into the cavity of the pelvis from above downward we see that the upper boundary, or superior strait, is shaped more like the heart of a playing card than anything else, the large end behind at the sacrum, and the smaller before at the pubis. The excavation below this, for about two inches—at the sides—is more nearly, though not regularly, round. The brim is smooth and rounded instead of being sharp, and the cavity is polished and regular. Lower down on either side, and projecting slightly into the cavity of the pelvis, encroaching upon its dimension from a quarter to half an inch, are the spines of the ischium. They are lancet-shaped and hooked slightly inward. Just above them begins a concave surface that extends obliquely downward and forward to the ramus of the ischium—the plane of the ischium. By some authors it is called the anterior lateral inclined plane. The great sacro-sciatic notch lies behind and extends above it, and when filled by the soft parts forms a depression, and the term posterior lateral inclined plane has been applied to it. The general direction of this concavity is towards the hollow of the sacrum behind. The anterior inclined plane is completed by the thyroid foramen when covered over by soft parts. It will be seen that a part of the posterior and anterior lateral inclined planes is formed of yielding tissue instead of firm bony structure. In addition to the fact that the oblique diameter of the pelvis, measuring from one posterior to the opposite anterior lateral inclined plane, is longer

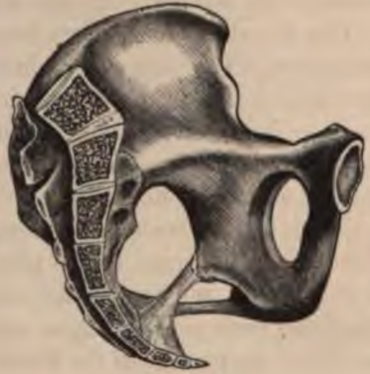


FIG. 1.

than any of the others, it may be somewhat increased by the elasticity of some of the tissues. It will be seen that the spine of the ischium is the apex of the triangular space lying below and between the two lateral inclined planes, the first point of resistance to the head in sinking down toward the bottom of the pelvis, and beyond which it cannot pass without change of position. It will be noticed that the anterior surface of the sacrum is concave from side to side, entirely straight from the promontory to the lower end of the third bone, and that the curvature commences at the fourth bone of the sacrum and continues almost in the segment of a circle to the coccyx, which is correspondingly bent forward, and thus extends the concavity. The anterior face of the sacrum and coccyx is smooth, with very slightly elevated lines showing the former divisions between the pieces now joined together. The commencement of the hollow of the sacrum, as it is called, is therefore below the third bone, and that cavity is formed by the curve in the two last bones of the sacrum and the coccygeal extension. The upper end of the curvature is about on a level with the spine of the ischium. The direction of this straight surface of the sacrum is from the promontory downward, and very decidedly backward, forming an inverted inclined plane perpendicular to the axis of the plane of the superior strait.

The inner surface of the anterior or pubic wall of the pelvis is constituted almost entirely of the body of the pubic bone; it is smooth and concave from side to side, and forms a plane inclined in the same general direction of the upper anterior surface of the sacrum downward and backward. This correspondence in the direction of the opposing anterior and posterior walls of the pelvis would unerringly conduct the head from the superior strait backward and downward to the hollow of the sacrum.

The superior strait is formed by the projecting edge of the sacrum behind, the linea ilio-pectinea on the sides, and in front by the upper border of the symphysis. Authors usually measure the pelvis in three different directions: at the superior strait, from the promontory of the sacrum to the symphysis pubis is the antero-posterior diameter, and measures from 4¼ to 4½ inches; directly across the centre is the bilateral, and is from 5 to 5¼ inches long; the oblique diameter is a line drawn from the sacro-iliac symphysis on one side to the ilio-pectineal eminence of the opposite side; its length is about 4¼ inches. The diameters of the cavity of the pelvis and inferior strait correspond in direction with these. The length of all the diameters of the pelvic cavity is 4¾ inches to 5 inches. Those of the inferior strait also are very nearly equal in length, and in the dry pelvis is about 4¼ inches. The antero-posterior diameter of the inferior strait is increased probably half an inch in labor by the extension of the coccyx backward. The soft parts filling up the great sacro-sciatic notch yield to the pressure of the fœtal head, and thus the oblique diameter of the inferior strait may be increased one-quarter of an inch or more. These measurements can only be considered as proximating the actual size of different pelves, as they differ widely in different individuals.

The inferior strait of the pelvis is included between the three projecting points at the bottom, viz., the two tuberosities of the ischium, one on either side, the point of the coccyx behind, and the arch of the symphysis in front. It is very irregular in outline; the tuberosities extend about a quarter of an inch lower down than the coccyx, while the arch of the symphysis is much higher than either. In the naked skeleton there are three notches between the three projections: the two great sacro-sciatic notches at the sides behind, and the arch of the pubis in front. A line drawn from the summit of the sacrum to the top of the symphysis pubis represents the plane of the superior strait, and when the woman stands erect forms an angle of from 55 to 60 degrees with the horizon; while in a like manner a line drawn from the point of the coccyx to the arch of the symphysis indicates the plane of the inferior strait, and varies from the horizontal but 10 degrees.

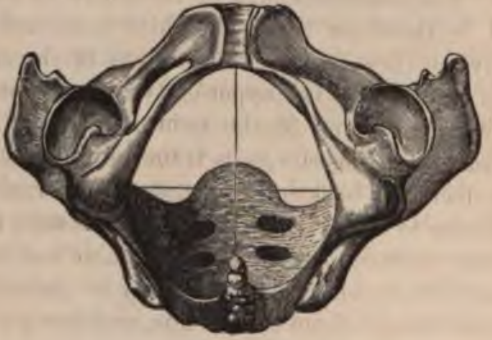


FIG. 2.

If these lines are continued forward they cross each other about one and a half inch in front of the symphysis pubis; of course they are widely separated behind, and continue to diverge the farther backward they are extended.

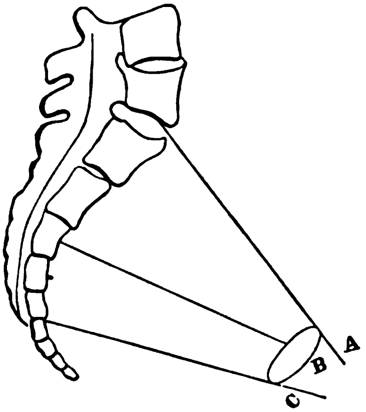


FIG. 3.—Planes of superior and inferior straits, and pelvic cavity.

The axis of the superior strait is a line drawn perpendicular to the centre of the plane of the superior strait, and exactly corresponds in direction with the upper anterior surface of the

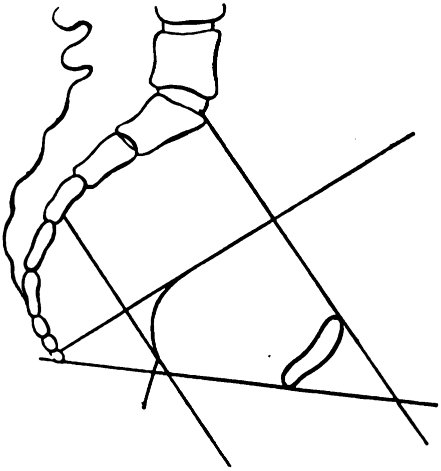


FIG. 4.—Axes of superior and inferior straits, and pelvic cavity with perineal extension.

sacrum. In passing down into the pelvis it touches first about the lower end of the sacrum. The axis of the inferior strait is represented by a line drawn perpendicular to the plane of the inferior strait. The axis of the cavity of the pelvis is a line equidistant from the lateral walls of the pelvis and corresponding with the curve of the sacrum and coccyx. Practically in labor the curve described by the head of the child varies this line opposite the end of the sacrum by pressing the coccyx backward, making a jog, and as the perinæum is so yielding as to permit the head to press it backward, the segment of a circle first drawn by Carus, and after him called Carus' curve, does not really represent the facts as they transpire.

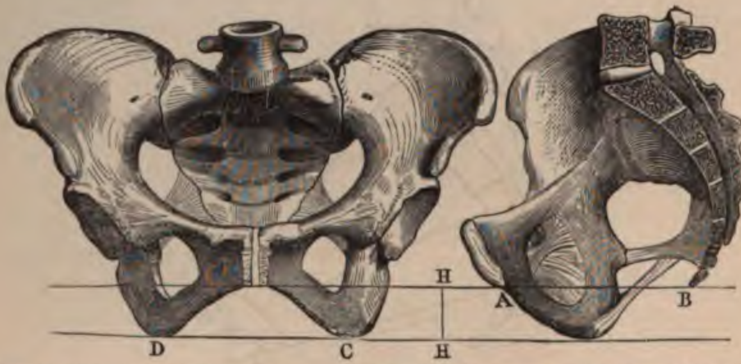


Fig. 5.—Showing the difference between the level of the coccy-pubic line and the bis-ischiatic. Lines A—B and C—D as measured at H—H.

The axis of the superior strait extended upward will vary in reference to the abdominal cavity with the flexions of the spine. When the spine is extended, the line representing the axis will pass out of the abdomen much lower than in the ordinary erect posture. If the spine is forcibly bent forward, the line of the axis will enter the thorax and be almost parallel with the direction of the spinal column itself.

The soft parts of the pelvis, which concern us obstetrically, are situated at the superior strait, in the cavity, and at the lower strait. They exercise an influence upon the diameters as described in the dry pelvis, and as a consequence are concerned in the mechanism of labor. The iliacus internus and the psoas magnus muscles project over the sides of the brim of the pelvis very decidedly, so as to lessen the bilateral diameter half an inch, and when the woman stands upon her feet their bodies are firm enough to modify the position in which the head enters the pelvis. When in a recumbent posture, with the thighs well flexed upon the body, the bodies of these muscles are relaxed and quite yielding. Upon the left side of the sacrum the rectum enters the top of the pelvis, and after fairly gaining the cavity this intestine assumes the central position in the hollow of the sacrum. When the rectum is empty and collapsed, it does not materially affect the oblique diameter; but if filled with fæces, the diameter from the left ilio-sacral junction will be shortened from three-quarters of an inch to an inch and a half. The reader will see that this leaves the diameter reaching from the right ilio-sacral junction the longest diameter of the superior strait. I think this will account for the more frequent entrance of the head with its long diameter in that direction.

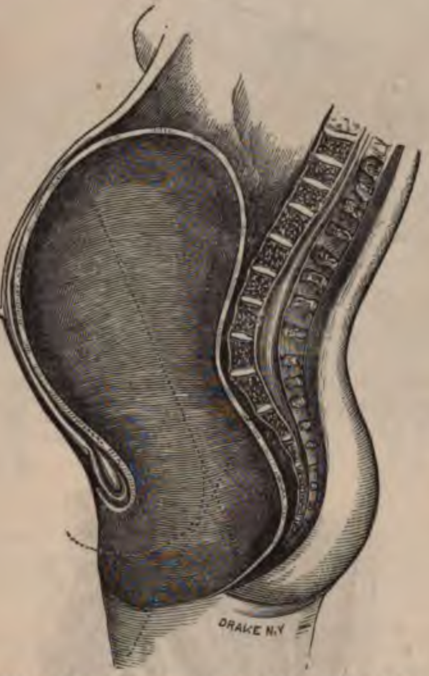


FIG. 6.—The dotted lines in this figure are intended to show the relation in the axes of the superior and inferior straits to the pelvic and perineal curves.

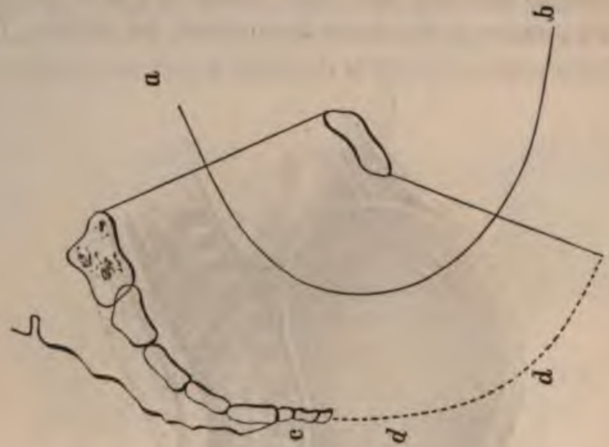


FIG. 7.

The bladder, in pregnancy, is drawn upward, and perhaps makes a very little difference in the length of the antero-posterior diameter of the superior strait. In the cavity of the pelvis the obturator internus covers the obturator foramen at the

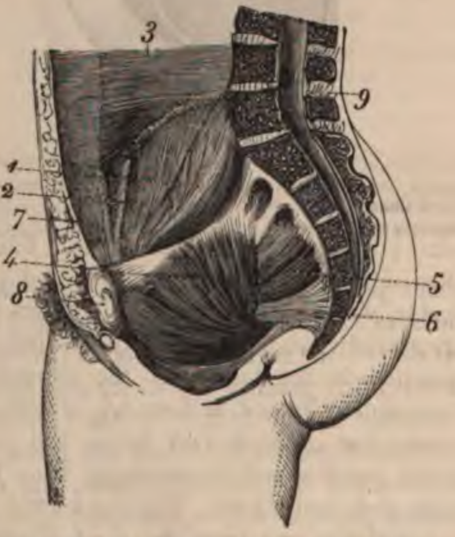


FIG. 8.—MUSCLES OF THE WALLS OF THE ABDOMEN AND INSIDE OF THE PELVIS.—1. Psoas. 2. Iliac. 3. Transverse. 4. Obturator Internus. 5. Gemini. 6. Sacro-sciatic Ligament. 7. Rectus Abdominis. 8. Pubis.

anterior end of the oblique diameter of the cavity, and by thus forming a yielding part to the wall, admits of very slight increase of room at this point, while the head is making the change from the oblique to the antero-posterior position. The pyriformis muscle, and the sacro-sciatic ligaments closing the great sacro-sciatic notch, make another yielding point in the pelvic wall. This yielding place extends through the most of the cavity of the pelvis down to the inferior strait, and permits of a decided increase of the diagonal diameter of the cavity and inferior strait. The effect of the elasticity of tissues over this great extent is to permit the spiral movement of the head to take place much more easily than if the wall was unyielding bone. The large and broad muscle, the levator ani, the coccygeal, transversus perinæi, constrictor vagina, and the sphincter ani, close the lower opening of the pelvis to within half an inch of the arch of the symphysis in the virgin, making a firm bottom upon which the superjacent viscera rest, and in its central antero-posterior portion is called the perinæum, the raphe of which may be traced from the point of the coccyx to the commissure of the vulva. The perinæum is about three and a quarter to three and a half

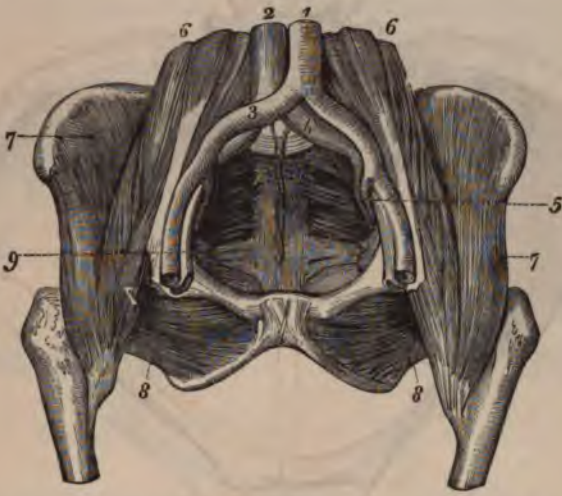


FIG. 9.—MUSCLES AND VESSELS OF THE PELVIS.—1. Aorta. 2. Vena Cava inferior. 3. Primitive Iliac. 4. Primitive Iliac Vein. 5. Internal Iliac Artery. 6. Psoas Muscle. 7. Iliac Muscle. 8. Obturator Muscle. 9. Median Sacral Artery.

inches long, but in cases of great distention will measure over five. The axis of the pelvis terminates technically at the end of the coccyx, where the perineal axis begins. The line representing this axis is more irregular in consequence of the variable distensibility of the perinæum, but may be said to be equidistant from the inner perineal surface to the arch of the symphysis in an irregular segment of a circle. We will better understand the whole extent of the axes of the superior strait, the cavity of the pelvis, lower strait, and its perineal extension, by the figure representing their whole extent.

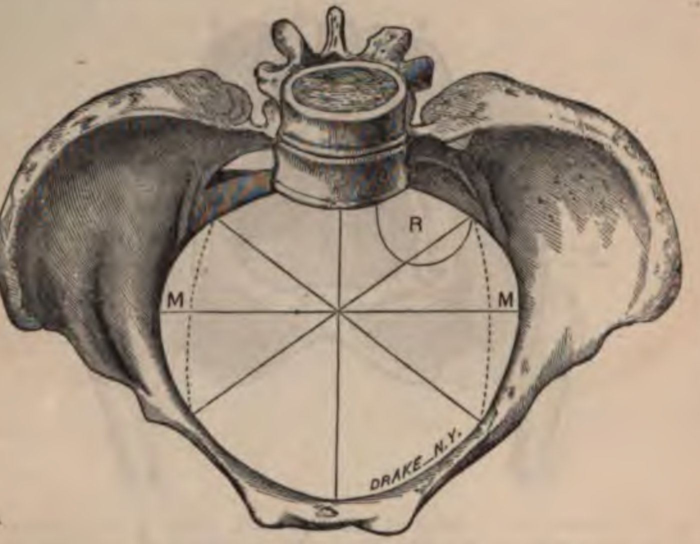


FIG. 10.—Intended to show the alteration in the length of the transverse and diagonal measurement of the Pelvic Cavity by the Rectum and Muscles at the Brim. R, The Rectum; M, M, Muscles.

THE FŒTAL HEAD.

THE most voluminous and most resistant part of the fœtus, the part which usually presents and passes through first, opening up the passage for the safe transit of the more compressible parts of the fœtus, is the head. Its form and size are adapted to the shape and dimensions of the pelvis of the mother; it is, therefore, usually described by writers soon after considering that cavity. The head of the fœtus is ovoid—the large end behind and the small end before. The bones are remarkably flexible, and may be compressed to some degree without fracture; the sutures are open, and more extensive than in the adult. The sagittal suture extends from the nose to the occipital bone. Where it crosses the coronal there is a quadrangular open space formed, by the deficiency of the angles of the two parietal and the two halves of the frontal bone, called the anterior fontanelle. In many cases it is more than an inch long and three-quarters broad. At the posterior end of the sagittal suture is a triangular opening called the posterior fontanelle. It is probably not often over half an inch from angle to angle. The coronal suture is also open, and extends from one temporal bone to the other, as in the adult. The lambdoidal suture is, like the other two, also very open. The fontanelles are occasionally very large, the anterior almost down to the nose; at other times they are very much smaller than the average, in which case the sutures are nearly closed up, and the ossification of the head far advanced. The edges of the bones are smooth instead of being serrated, and are attached to each other by the pericranium and dura mater extending across from one to the other. The edges are so widely separated, and the attachment so elastic, that the bones may be made to ride over each other; and, indeed, as the head is pressed down through the pelvis the sutures feel more like what, at the time, they really are, elevated ridges, than depressed sutures.

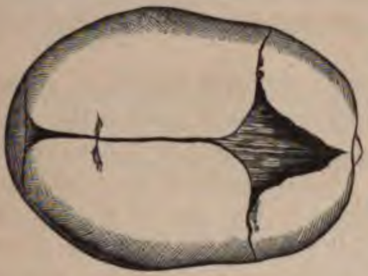


FIG. 11.—View of the head showing the fontanelles.

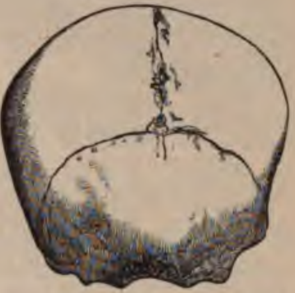


FIG. 12.—Occipital view of the head showing the bi-parietal diameter.

There are other sutures, as the temporal, sphenoidal, etc., but as they do not serve the purposes of diagnosis they need not be particularly described. Occasionally we meet with other open spaces where ossification of the head is not advanced to its usual degree, which might mislead the inexperienced in making examinations if he were guided by these alone. I shall recur to this subject again in diagnosis of position of presentation. The beneficial effects of this loose structure of the skull, enclosing an almost diffluent brain, in allowing the head to be moulded in the most favorable shape without serious damage, are quite apparent to a reflecting reader.

By the measurement of the head in different directions we are enabled to calculate the most favorable relative position that may be assumed by it in passing through the pelvis, and hence deduce valuable indications for practice. The diameter of the head from the central part of the occipital bone to that part of the frontal immediately above the nose—occipito-frontal—is 4½ inches; from the most prominent part of one parietal bone to the same point on the opposite side—bi-parietal—is 3½ inches; from the most prominent part of the occipital bone to the end of the chin—occipito-mental—is 5½ inches; from the prominent portion of the occiput to the anterior part of anterior fontanelle is 3½ inches. The fronto-mental diameter is about 3½ inches. These are the diameters of the head most frequently engaged in the different diameters of the pelvis. Several more are mentioned by different authors, such as the trachelo-bregmatic, bi-mastoid, bi-malar, cervico-mental, etc., which may be studied to advantage in Hodges' excellent monument of obstetrical learning. In considering the

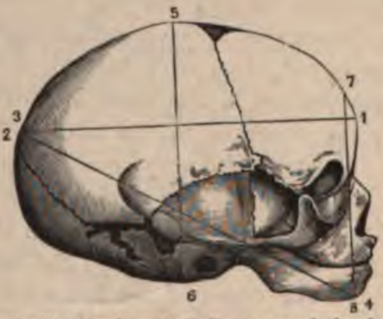


FIG. 13 shows the longitudinal and vertical diameters of the fœtal head. 1, 2, Occipito-frontal. 3, 4, Occipito-mental. 5, 6, Trachelo-bregmatic. 7, 8, Fronto-mental.

measurements of pelvic diameters of the mother, and the cranial diameters of the fœtus, we can of course only arrive at proximate results and averages by measuring many specimens; the measurements of these diameters on the living patients, in actual practice, will be still less exact, and the indications for practice will depend in great measure on the result of the efforts of nature in the great mass of cases, while satisfactory results from actual measurement will be obtained only in exceptional and extreme cases. This fact, however, should not be an excuse for want of every possible knowledge and means for determining accurately the deviations in size and shape of the pelvis when they do occur.

Measurement of the pelvis is often resorted to to determine its size. It is very difficult to get the dimension of it perfectly in life, yet we may always approach it so nearly as to be of much use in forming a judgment in practice. The simplest means for this purpose are the fingers. The antero-posterior diameter may be more accurately measured with them than the other two. When but one, the index finger, is used in the naturally formed pelvis, we cannot reach the promontory of the sacrum by about one inch and a half; but if we introduce both the index and middle fingers the promontory can be felt, but with considerable difficulty, and the perinæum must be pressed upon with some force. I think from repeated trials that unless the antero-posterior

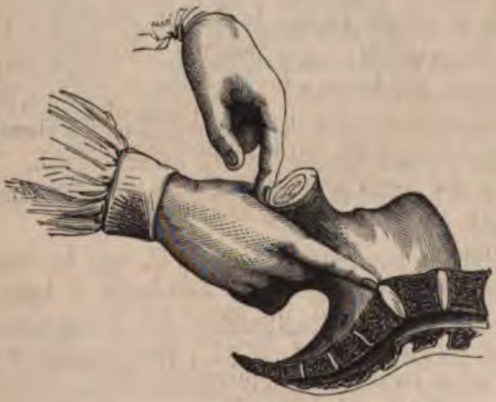


FIG. 14.

diameter is reduced to less than three inches, we will not be able to feel the promontory with the index alone introduced.

The ends of the fingers should be directed well upward, to get the right direction for the promontory. Unless the pelvis is very much contracted, the bilateral or oblique diameters cannot be measured by the hand.

PELVIMETERS.

Many forms of these instruments have from time to time been invented, but very few have been sufficiently simple and accurate to induce a general use of them. It would, I think, be consuming time and space needlessly to describe even a few of these forms. There are two pelvimeters of recent invention, either of which will give quite satisfactory results: one by M. Van Heuval, of Brussels, and the other is of my own construction. It is indeed a modification of Boudelocque's callipers. I prefer the last, because so much more simple in construction and application. I take the description of M. Van Heuval's instrument from the last edition of Cazeau's Midwifery.

As will be seen, it is a pair of callipers "composed of two branches, one of which is fixed and the other movable. The first, A, B, is eleven inches in length, slightly curved, and flattened at its extremity; it is inserted into the vagina for internal measurement, and bears a hooked ring near its middle; beyond is a non-graduated arc of a circle. It articulates below, like an ordinary pair of compasses, with the prolongation of a sheath in which is inserted the lower extremity of the other branch. The curvature, length, and hooked ring are the same as in the small geometric pelvimeter.

"The second or external branch, C, B, may be lengthened at pleasure. It carries at its upper extremity a long horizontal screw, for the purpose of facilitating the disengagement of the compass after its internal application; from thence it curves outwardly, and finally, in descending, becomes straight and quadrangular, and enters the above-mentioned sheath. The latter, which is open at both ends, is furnished with a groove externally, for the purpose of receiving a projection of the branch, which prevents its escaping from the sheath. Its inner side is provided with a spring bearing a point, which passes through the side and lodges in a small hole in the branch, so as to prevent the latter from slipping up and down, and to keep the two extremities of

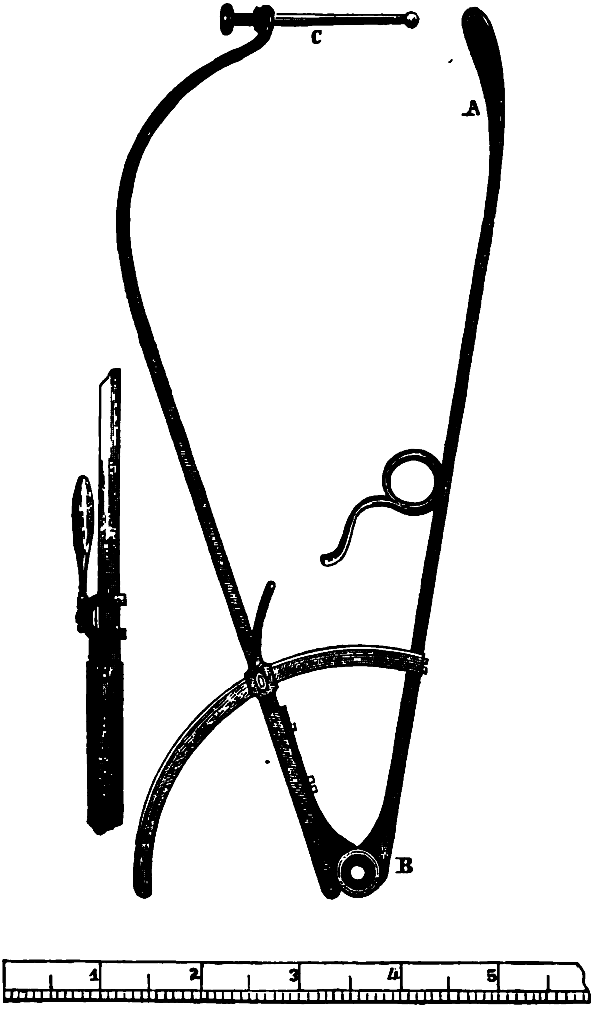


FIG. 15.

the branches on a level. When the spring is raised, the point escapes from the hole in the stem, which then becomes movable; when released, and pressing upon its surface it keeps it at any height desired. The arc of a circle attached to the vaginal branch is applied, the right side of the external branch is traversed by the latter at right angles, and also by the arc. On the opposite side is fixed a vice moved by a lever, which presses these two pieces together and prevents all motion. Lastly, a graduated scale serves to measure the distance between the extremities in any given position.

"Let us now examine the mode of application of the new pelvimeter. The compressing vice of the slide is relaxed, and the point of the spring engaged in the small hole of the external branch keeps the extremities of the instrument on the same level, so as to form a pair of callipers. The extremities are applied either to the antero-superior processes of the iliac bones, to the crest of the ilium and tuberosity of the ischium of the same side, or the bottom of the horizontal screw is placed upon the spinous process of the last lumbar vertebra, and the extremity of the vaginal branch against the mons veneris by passing between the thighs of the patient; again one may be applied to the upper and the other to the lower edge of the pubis, to the tuberosity of each ischium, or finally upon the coccyx and under the arch of the pubis. Thus are obtained the extent of the transverse diameter of the greater pelvis, the depth of the entire cavity, the distance from the loins to the pubis, the length of the symphysis pubis, and the transverse and the antero-posterior diameters of the inferior strait, the value of each of which is determined by the scale. To measure the interior of the pelvis, the woman is placed on her back in the bed, with the breech brought to the edge of the mattress. The extremities of the diameter of the superior strait are marked by the aid of cord and a quill. Then one or two fingers of the left hand are introduced into the vagina as far as the promontory of the sacrum. The right hand holds the callipers unfastened, and opened to its full extent, and with the external branch depressed in its sheath.

"The extremity of the vaginal branch is next passed into the genital organs along the previously introduced fingers, which press it against the sacro-vertebral angle, while the base of the thumb engages itself in the hook. The instrument is held motionless by a single hand. Then the thumb, fore and middle fingers of the right hand grasp the external branch above the arc of a circle, and raise or lower it in its sheath, until the button of the horizontal screw corresponds to the mark made upon the mons veneris. As soon as this is effected by merely grazing the skin, the ring-finger presses the lever of the vice forwards so as to fix the instrument in its place. It is then withdrawn from the woman's parts and the distance between the extremities ascertained by means of scale. The first stage of the operation being accomplished the vice is relaxed and the extremities of the callipers made again to correspond. The index finger of the left hand is again introduced into the vagina and applied this time behind the pubis. The extremity of the vaginal branch is conducted thither, with its concavity in front, by the right hand. As soon as it has reached the upper edge of the symphysis, the branch is seized with the entire hand and the little finger passed into the ring of the hook. The external branch is afterward seized above the arc by the three first fingers of the right hand, and the ring-finger pushes the lever of the vice forward as soon as the button of the horizontal screw corresponds to the spot on the mons veneris. This application should be made as gently as the first,

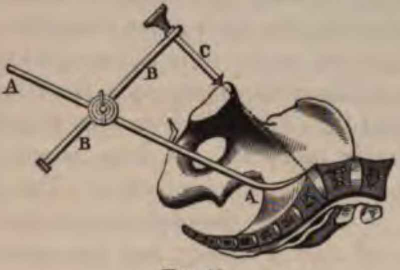


FIG. 16.

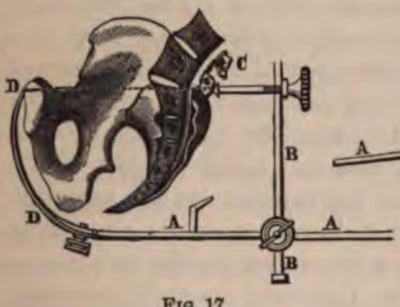


FIG. 17.

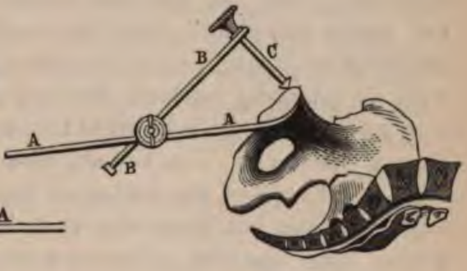


FIG. 18.

merely grazing the skin. Should any difficulty be experienced in the withdrawal of the pelvimeter, the horizontal screw may be screwed back, provided it be restored to its position after the extraction. The distance between the extremities should be again measured by the scale, and subtracted from the first result to obtain the extent of the sacro-pubic diameter. The only error possible in this process results from the unequal pressure upon the skin in the two applications, or else upon the irregular position of the branch behind the pubis, which may be either higher or lower than the sacro-pubic line itself. A little attention only is necessary to avoid these slight causes of error. The proceeding is exactly the same for obtaining the oblique diameter. The pelvimeter is first loosened, opened widely, and the external branch lower end in the sheath. If the left sacro-pubic space is to be measured the instrument should be again taken in the right hand, the button of the external branch is placed upon the mark over the left ilio-pectineal eminence, and the vice is tightened by the ring-spring. The instrument in its diagonal position is withdrawn from the parts, and the distance between the two extremities ascertained by the scale. Having noted the latter, the vice is unfastened and the two extremities of the callipers brought together. Then the fore and middle fingers of the left hand are again introduced into the vagina, behind the left ilio-pectineal eminence, as also the extremity of the vaginal branch, with its concavity forward; the branch is next grasped with the left hand, and the little finger at the same time introduced into the ring of the hook. The thumb, fore and middle fingers of the right hand replace the button of the external branch upon the mark over the left ilio-pectineal eminence, while the ring-finger presses upon the vice. The same precaution should be taken as in the first instance of turning the horizontal screw if necessary, in order to withdraw the instrument and to return it to its place, for the purpose of measuring the new distance between the extremities. The subtraction of this quantity from the other gives the requisite dimensions. The right sacro-pectineal distance is ascertained in the same way, except that the fingers of the right hand are then introduced into the vagina, the instrument being held in the left hand.

"Finally, the transverse diameter of the superior strait is measured in nearly the same manner. The callipers being prepared as usual, and held in the right hand, two fingers of the left hand, in state of forced supination, the thumb being directed downward, are carried to the right side of the pelvis. The convexity of the vaginal branch is directed towards that point, and held there by the pressure of the introduced fingers and by the left thumb which is engaged in the hook. The free hand conducts the external branch beneath the left, which is raised for the purpose, and places it upon the mark made on the corresponding hip. The ring-finger of the right hand fixes the instrument in its transverse position by pressing upon the lever of the vice; and the distance between the extremities is measured by the scale after extraction. To make the second application the vice is relaxed, and the external branch elongated beyond the extremity of the vaginal one, then the fore and middle fingers in the genital organs on the left side of the pelvis. The extremity of the vaginal branch is conducted thither by the right hand, and kept there by the left hand, the little finger of which is inserted into the ring of the hook. The external branch is finally directed by the free hand beneath the left thigh, upon the hip of the same side, and fixed as usual. The horizontal screw is next turned for the purpose of withdrawing the pelvimeter. When restored to its place, the distance between the extremities is again taken, and thus subtracted from the first measurement gives the length of the transverse diameter. The diameters of the excavation may be measured in the same manner, it being only necessary to take the precaution to mark spots around the pelvis between the limits of the superior and inferior straits."

This complicated and lengthy description of the mode of using the instrument is rendered necessary on account of the complicated nature of the instrument; and with the hope of simplifying the process of measuring the pelvis I will describe the pelvimeter I now recommend as the simplest, most convenient, and at the same time just as accurate instrument. My instrument is thirteen inches long; the handle being four, and the blade nine inches long. It is a pair of callipers with blades of unequal curve, and a scale of measurement fixed into the handle, as seen in Figure 19. A is the internal or vaginal blade, and is not so much curved as the (B) external blade. The place of the greatest curve in A, the internal or vaginal branch, is three inches from the line of junction between the two; while the greatest curve in B, the external branch, is six inches from the line of junction; the figures 3 and 6 denote these distances. The branches are joined together at the ends of the straight or handle part, D, by a firm joint, and a groove should be made in one part of this handle portion, in which the other can sink as they close, so as to add to the security of the parallel between the two. The handle part and that portion of the branches near it should be heavy enough to prevent any deviation from the direct line by the application of a small amount of force; indeed, the whole instrument should be strong and firm. Each branch terminates in a button-like extremity. The scale should be so placed and divided off in such manner as to correctly indicate the distance of separation of the button extremities of the branches in any position in which the instrument may be placed. To measure the internal pelvis with this instrument, it is necessary to mark the points externally opposite the termination of different diameters. For the antero-posterior diameter, a mark with ink should be made on the skin opposite the superior edge of the pelvis at the symphysis, another on the spinous process of the last lumbar vertebra; for the transverse diameter, a stain opposite the top of each trochanter major when the patient is in the erect posture; for the oblique diameters, at

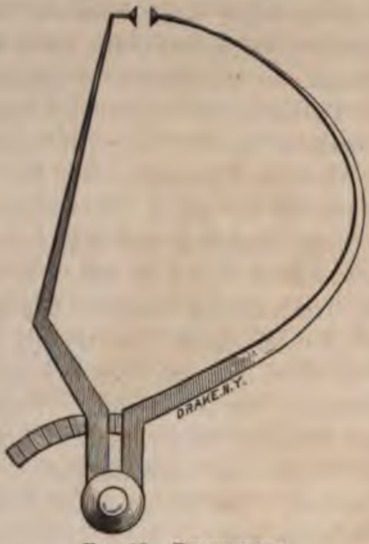


FIG. 19.—PELVIMETER.

the upper part of the sacro-iliac symphysis on each side behind, and at the ilio-pectineal eminence on each side in front. The patient should lie on the right side, with the breech slightly projecting over the edge of the bed, and the thighs strongly flexed on the body when we measure the thickness of the sacrum. The accoucheur may then introduce two fingers of the left hand far enough to reach the promontory of the sacrum, while with the right hand he will insert the vaginal branch of the callipers; the branches sufficiently separated to permit the external branch to pass up outside, behind the sacrum, to the mark on the spine of the lumbar veterbra; while an assistant carefully adjusts the outside branch the operator will see that the internal is centrally placed upon the promontory internally. By observing the scale we will ascertain precisely the thickness of the top of the sacrum, etc., at this end of the diameter. The instrument is then removed from the vagina, and the patient turns upon her back. Next the fore

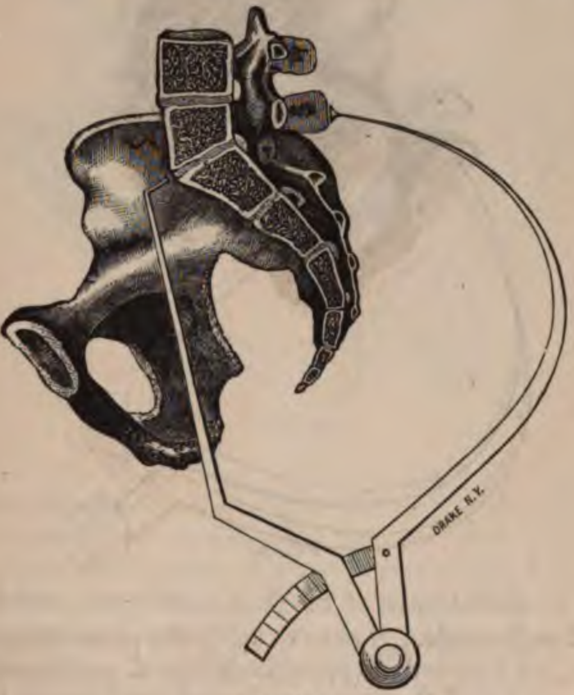


FIG. 20.

finger of the left hand is introduced and carried along the inner surface of the symphysis until it reaches the upper edge of the pubis, when the button of the *outside* branch, guided by the finger, is carried up to that point inside, and the *vaginal* branch placed upon the mark outside. This will give us an accurate measure of the thickness of the pubis at this place, which should be noted on the scale. Now to complete the measurement of this diameter, we have only to place the button of one branch on the mark at the top of the sacrum posteriorly, and that of the other on the mark on the pubis, and note the distance on the scale. We get the length of the diameter by subtracting the sum of the two first from the last measure. The transverse diameter may be most easily and accurately measured with the woman standing, her limbs well separated. The operator, kneeling or sitting on a low stool in front of the patient, introduces the fore and middle

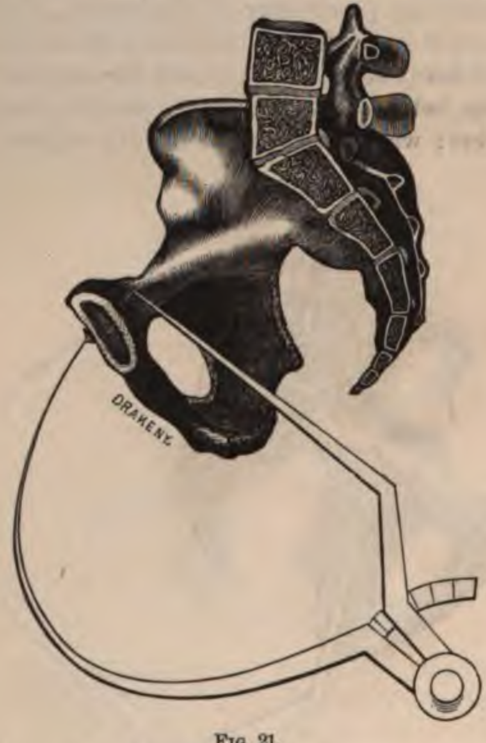


FIG. 21.

fingers of the left hand to middle of the side of the pelvic brim, and with the right introduces the vaginal branch, which is guided by the fingers within the vagina until the button is properly placed. The introduced branch is retained in this position until an assistant carries the button of the external branch to the mark at the top of the trochanter major. The scale will then indicate the distance between the points of the two branches, and consequently the thickness of the walls of the pelvis at this point. The opposite side may be measured in the same manner, only reversing the hands, using the right internally and the left externally. After taking the measure of both sides in this way, we then place the points or buttons of the two branches on the spot each side. This will give us the entire thickness of the walls and breadth of the pelvis, and if we subtract the sum of the two first from this last, we will have the length of the diameter internally. The oblique diameters may be measured like the antero-posterior—the patient on her side while the measure of the thick-

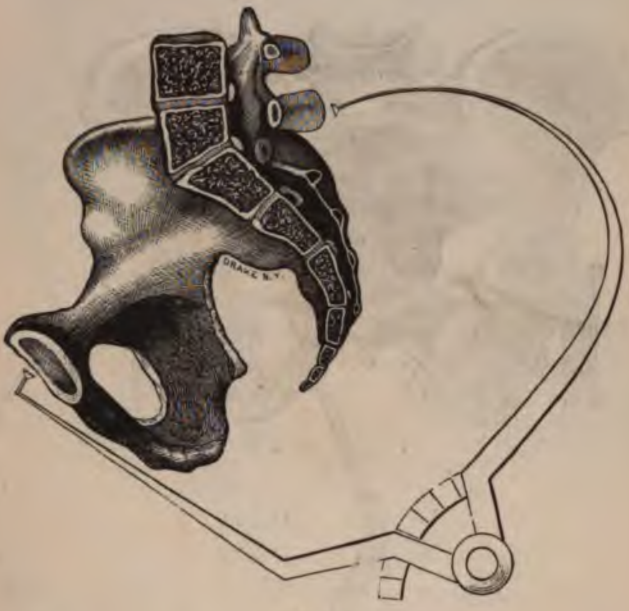


FIG. 22.

ness of the sacro-iliac synchondrosis is taken, and on her back while that of the ilio-pectineal eminence is made; standing up when the measure over all is taken. The measure of the diameters of the inferior strait may be made more easily. The button of one branch, placed on each tuberosity of the ischium, will show on the scale the length of the transverse diameter, and by adjusting the button of one blade to the point of the coccyx, and the other to the arch of the symphysis, the scale will indicate the length of the antero-posterior diameter. The reader will doubtless be able, from this account of the manner of using the instrument, to understand the plan of measuring the diameters of the excavation without any more detail.

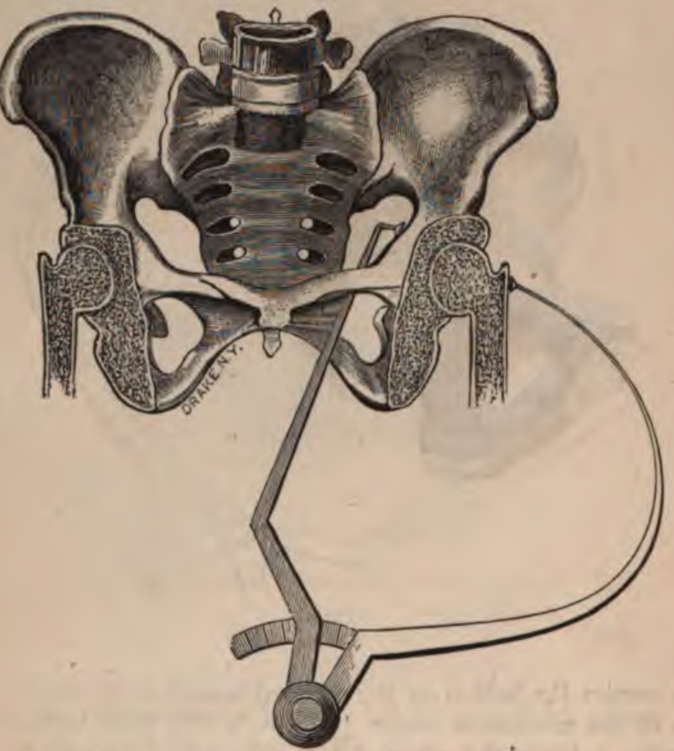


FIG. 23.—Pelvimeter applied to the side of the Pelvis at the Superior Strait.

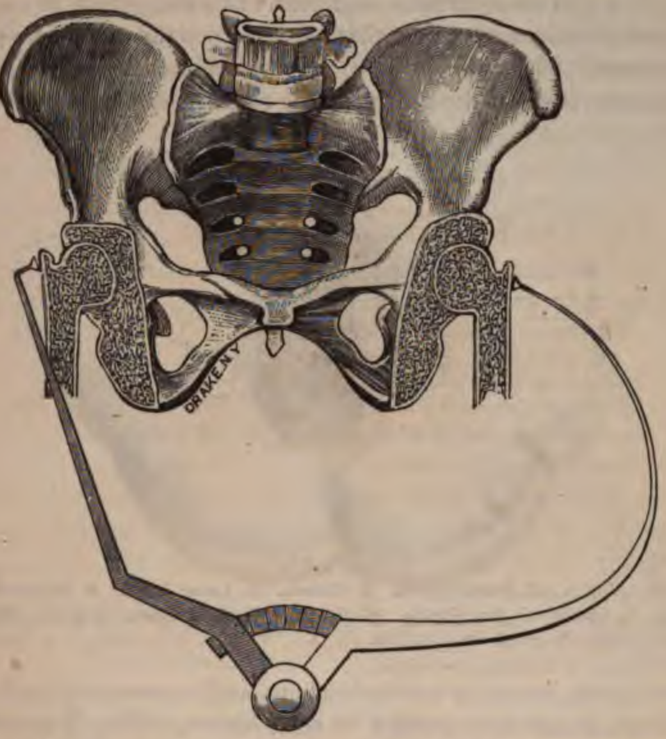


FIG. 24.—Pelvimeter applied over the pelvic brim from one trochanter to the other.

FEMALE ORGANS OF GENERATION.

These are divided into internal and external, according as they are situated externally to or within the pelvis.

The external are the mons veneris, external and internal labia, clitoris, and hymen, with which is also described the meatus urinarius. The mons veneris and the closed external labia constitute what is usually termed the pudenda, while the parts contained within, which become visible by separating the external labia, are known as the vulva.

The mons veneris is a thick cushion of adipose and tough areolar tissues lying over the upper part of the symphysis pubis and lower median line of the abdomen, about two inches long in its perpendicular measurement, and nearly as wide. Upon its surface are many sebaceous follicles that serve to keep the surface properly moistened. The *labia majora*, or external labia, spring from the mons veneris about the centre of the external surface of the symphysis pubis, are about two inches long, and in persons of moderate flesh are round and pouting in their aspect. They join at the perinæum, and at this lower commissure is situated the fold of mucous membrane called the fourchette, because when the labia are drawn apart, two little duplicatures, one on each side, stretch up from the commissure, and, to the fertile imagination, suggest the idea of the prongs of a fork. In point of density they contrast strongly with the mons veneris, the former being dense and inelastic, while the labia are loose in structure and capable of very great distention without danger to their integrity; they are abundantly supplied with vessels and nerves. Within the centre of the labia there is a rudimentary cavity, being imperfect by having frail and sparse fibres of connective tissue running through it and connecting its sides. This is regarded as the female analogue to the male scrotum. The external surface of the great labia and the mons veneris is covered with an abundance of hair in most persons. In rare instances this hirsute covering is entirely wanting, and the parts are bare as in childhood.

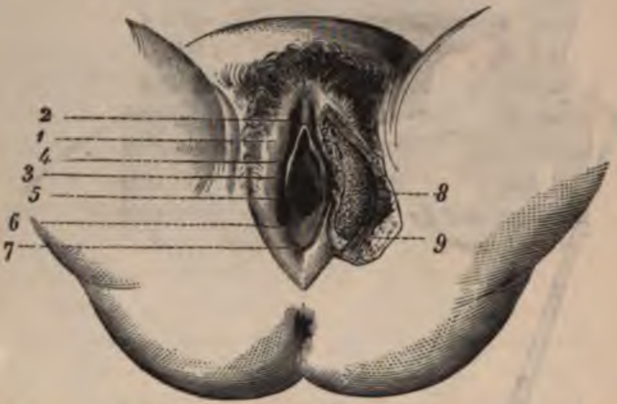


FIG. 25.—VULVA.—1. Labia Majora. 2. Clitoris. 3. Lesser Labia. 4. Meatus Urinarius. 5. Orifice of the Vagina. 6. Hymen. 7. Fossa Navicularis. 8. Bulb of the Clitoris. 9. Constrictor Vaginæ.

The inner surface of the labia is lined with mucous membrane, continuous with the skin of the outer surface and the membrane of the vagina within. A short distance below the upper commissure of the labia, and situated on the symphysis, above the arch, is the clitoris, the tissues and mode of arrangement of which are so similar to the male penis as to be likened to that organ by anatomists. The corpora cavernosa are attached on either side to the rami of the ischium, and pass up nearly to the arch of the symphysis, where they gain the anterior face of the pubic bone, extend up and are attached to the symphysis nearly half an inch above the arch. They here unite and form a very slight projection, where they are covered by the corpus spongiosum; the whole making, in most women, a mere prominence not much larger than a wheat corn, which is covered by the mucous membrane. Around and above, but in contact with the clitoris thus formed, is a rugous fold of the mucous membrane that almost hides it from view, named the prepuce of the clitoris. Extending from this fold of membrane, and connected with it by a frenum on either side of the clitoris, are the lesser labia—labia minora. They stand out from the inner edge of the greater labia quite prominently, and in some protrude from and overlie the edges of them. These lesser labia are nothing but mucous membrane held in this position by the intervention of connective tissue. They are very delicate and vascular, except when exposed to the air or friction of the clothing, or much imprudent handling, when they become dry and rough. The vestibule is the triangular smooth surface covered with very thin delicate mucous membrane that is exposed by turning the lesser labia outward. The upper corner or apex of the triangle is at the clitoris, and the base, half an inch lower, is at the arch of the symphysis pubis.

The entire vestibule lies on the symphysis; and at its base, and immediately beneath the arch of the symphysis, and in contact with it, is the meatus urinarius, easily recognized by the little tubercular and pouting elevation around it. The mouth of the vagina is seen by opening the labia, occupying a position immediately below the symphysis; in the virgin it is ordinarily closed by the action of its sphincter, and just within is the *hymen*. The hymen is ordinarily a crescentic fold of mucous membrane, slightly but decidedly encroaching upon the vaginal opening from below, strengthened in some cases by a pretty firm layer of fibres. It is easily ruptured generally, and often wanting in the adult virgin, while in rare cases it is very firm; it may resist marital approaches, and even parturient violence, and be carried through the whole child-bearing term of life. Writers describe varieties of shape of the hymen; it occasionally closes the whole vaginal opening to the urethra, sometimes it stretches across from one side to the other, leaving an opening above and below it.

The great labia terminate in the strong muscular partition between the vagina and rectum, the perinæum. This latter is about an inch and a quarter wide, made up of the contributions of the sphincters ani and vaginæ, where they commingle and decussate in such a manner as to be lost in each other—the commingling of the opposite fibres of the levator ani and transversus perinæi muscles, etc.

This thick assemblage of muscular fibres is broad on the cutaneous surface, separating, as has been before said, the anus and vaginal orifice by a space of one inch and a quarter. It extends up between the vagina and rectum about an inch, terminating where these two tubes approach each other. At the raphe or dividing line, if we push a knife upward to its termination we will find that it has traversed a triangle, the base of which is at the skin, and the apex above between the rectum and vagina.

The importance of the vascular apparatus of the clitoris induces me to call the attention of the reader again to that organ. The corpus spongiosum, which covers the ends of the two corpora cavernosa, is supplied with blood by a branch of the pudic artery, and has connection with the remarkable congeries of veins called the bulb of the clitoris. (See Fig. 25.) This collection of tortuous, commingled, and interlacing veins is situated immediately behind the labia majora, on either side, at their junction with the vagina, so that an instrument penetrating the centre of the labia would wound it. It is from one and a half to two inches long when distended by injection, and one quarter to half an inch in diameter at the thickest part. The clitoris is connected to this venous body by one and sometimes more small veins. There are also several venous tubes, connecting the upper end of these bodies to each other, lying across the vestibule. During venereal orgasm the clitoris and its bulbs are strongly injected with blood, and thus undergo a kind of erection, and feel somewhat hard under the finger.

After the disappearance of the hymen this fold of mucous membrane is apparently concerned in forming two or three small soft bodies, elevated slightly above the surface along the inner face of the greater labia, where their mucous lining is continuous with that of the vaginal tube. These bodies are named carunculæ myrtiformes. The secretory apparatus of the pudenda and vulva consist of numerous ceruminous glands scattered over the hairy surface of the mons veneris and external labia, mucous follicles abundantly supplied to the mucous membrane of the vulva, and a

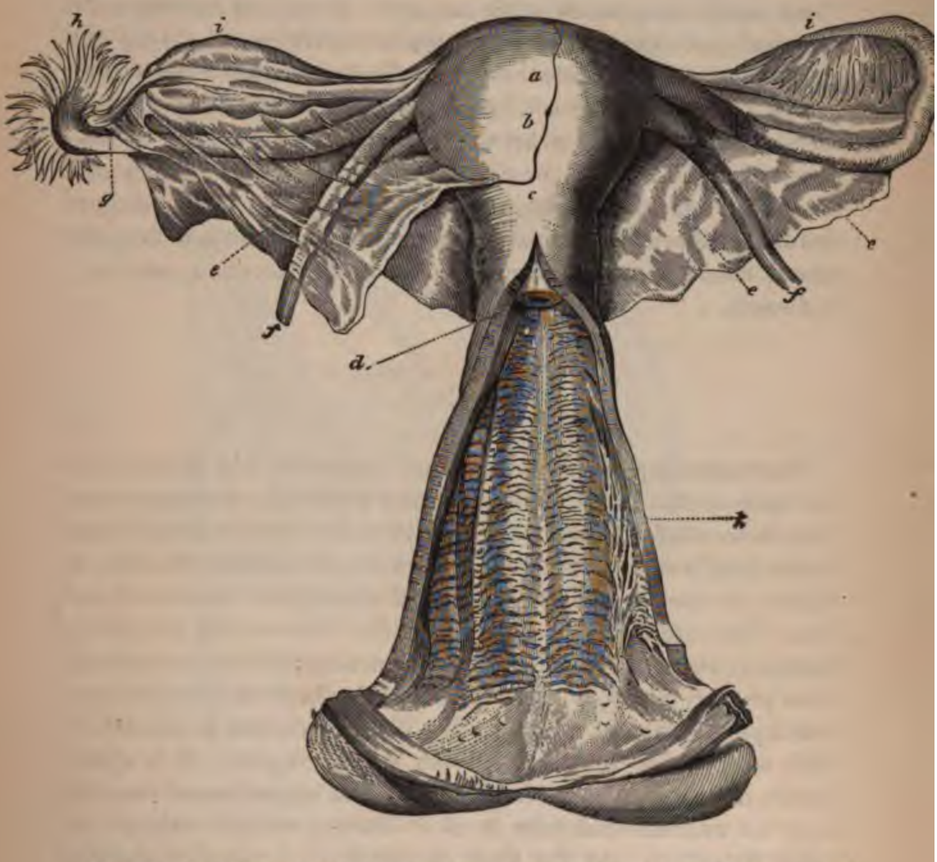


FIG. 26.—THE UTERUS AND APPENDAGES.—*a.* The Fundus. *b.* The Body. *c.* The Cervix. *d.* The Mouth. *e.* The Broad Ligament. *f.* Round Ligament. *g.* The Fallopian Tube. *h.* The Fimbriæ. *i.* Ovaria. *k.* The Vagina.

large mucous gland called the vulva-vaginal gland. The muciparous follicles are especially abundant below the clitoris, on the vestibule, and about the meatus urinarius. The vulva-vaginal gland is behind the substance of the greater labia, in contact with the lower end of the bulb of the clitoris, or about one-third of the distance from the fourchette to the arch of the symphysis. It is formed by the collection of a number of muciparous tubes lying close together and converging into one larger canal for an outlet. These are all enclosed in a thin capsule. It is about half an inch long and not quite so wide, somewhat pyriform in shape, its small end turned towards the vulva, where the small tube forming its outlet terminates. The small open mouth of this tube, large enough to admit a bristle, may often be discovered by the naked eye. This gland produces more mucus perhaps than all the vulvar mucous follicles beside, and in a state of excitement thoroughly lubricates the parts. Sometimes this duct gets stopped up and causes a painful accumulation of the secretion, resulting in abscess.

VAGINA.

The vagina is a membranous canal formed of fibrous, spongy, and mucous tissues. The fibrous is firm and thick, making a continuous sheath for its whole length; the outer layer resembles the dartos membrane. Contained in the wall substance of this fibrous tube is a vascular spongy tissue, and some large vascular channels. The vascular tissue is greater at the lower end of the canal, especially about the urethra, where sometimes during pregnancy, from pressure above, it swells so as to excite in the mind of the patient apprehension of a tumor. The fibrous structure is connected with a muscular layer around the ostium vagina. It is quite elastic, and in virgins it often contracts the vaginal canal so as to keep the walls of that tube in close contact, while it admits of great distention. At the time of menstrual congestion, during pregnancy, or congestion from any other cause, the vascular tissue is turgid with blood, which gives the inner surface a dark purple color.

The mucous membrane lining the vagina is thick and plicated when the canal is contracted; thin and smooth when the tube is much distended. These rugæ are most obvious on the anterior wall, where they converge from the sides along a central line, and produce a thick columnar appearance. They are so prominent as to make the membrane rough and uneven. On the posterior wall this arrangement is less marked. From the meatus urinarius, along the anterior wall to the cervix uteri, the distance is from two to two and a half inches. The posterior wall of the vagina is concave, following the general direction of the perineal and sacral axes, and is much longer. From the fourchette to its greatest extent beyond and behind the cervix, the posterior wall measures from four to five inches long. The anterior and posterior walls of the vaginal canal ordinarily lie in contact, yielding to an intruding body, and closing after it when withdrawn. Sometimes the sides are closely applied to the pelvic walls when greatly distended. The bladder and urethra are above the vagina, and closely bound to it by connective tissue; therefore, if we pass a knife through the anterior wall of the

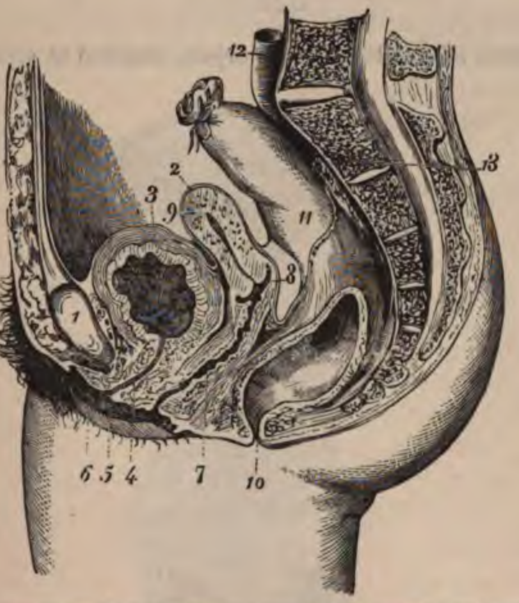


Fig. 27.—Section of the Pelvis showing the Relations of the Organs.—1. Pubis. 2. Peritoneal covering to the Uterus. 3. Bladder. 4. Urethral Canal. 5. Meatus Urinarius. 6. Great Labia. 7. Vagina. 8. Os Uteri. 9. Fibrous Structure of the Uterus. 10. Anus. 11. Rectum. 12. Aorta. 13. Sacrum.

vagina anywhere behind the symphysis it will wound one of these organs. For something like an inch back from the fourchette the posterior wall is in contact with the perinæum. At this distance it is approached by the rectum, which continues in contact with it, separated only by the thin membranous parietes of the two, for about an inch and a half more. The vagina here curves more forward, leaves the rectum, and for an inch and a half more is covered posteriorly by the peritonæum, where it forms the recto-vaginal *cul-de-sac.* At its upper end the vaginal tube receives, encircles, and is closed by the uterus. The cervix uteri projects into the vaginal cavity in the virgin about half an inch, and the fibrous substance of it and the vagina interlace and are continuous.

UTERUS.

The uterus is a hollow fibrous organ, situated at and surmounting the internal extremity of the vagina. It is pyriform in shape, compressed in its antero-posterior diameter, and the large end is

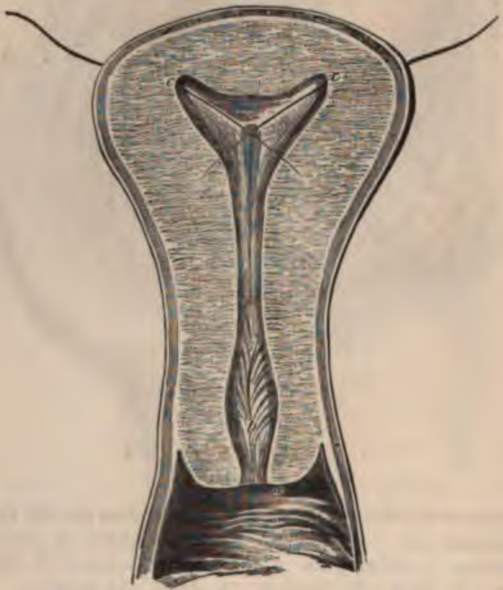


FIG. 28.—BI-LATERAL LONGITUDINAL SECTION OF THE UTERUS.—*c c.* The corners of the uterine cavity and entrance of the Fallopian tubes. *b a.* The plicæ in the mucous membrane of the cervix.

upward. The portion next to and in the vagina is called the cervix or neck; the middle and more expanded part, the corpus or body; the upper, the fundus uteri. Its cavity somewhat resembles that of a bottle, with the mouth downward. The mouth looks into the vagina; from this last runs the narrow tubular cavity upwards through the neck, terminating in the more expanded cavity of the body, which is triangular in shape, the apex being downward toward the neck, the shorter angles extending laterally above. There is a constriction at the junction of the cavities of the cervix and body, called the internal os uteri, as contradistinguished from the external os uteri, situated at the vaginal extremity of the cervix. This description of the cavities has reference to their appearance when viewed from before backward. The inner surfaces of the anterior and posterior walls lie in contact, and if the cavities are viewed from the side, are seen as one continuous slit from top to bottom. The length of the whole uterus is from one inch and three-quarters to two and a half inches, it is not quite an inch thick from before backward, and from an inch to an inch and a half in the widest place from one side to the other. Its weight, divested of its appendages, entirely, is from three-quarters of an ounce to two and a half

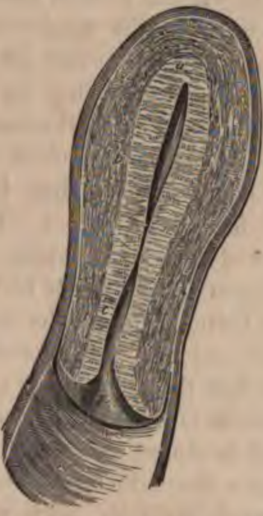


FIG. 29.—LONGITUDINAL SECTION OF THE UTERUS.—*a.* The Fundus. *b.* The Body. *c.* The Cervix. *d.* The Os Uteri. *e.* Small part of the Vagina.

ounces. The uterus of a virgin differs in size and shape to some extent from that of the multipara and the aged. It is not so broad, proportionately thicker, and the fundus more elevated and arched than the uterus of a woman who has had a number of children. There is also a more marked constriction at the junction of the body and cervix. The cavity of the body in the multipara is not so perfectly triangular in shape, especially in the lower angle, nor so sharp as in the virgin; it is also more capacious and longer. The uterus of the old woman is smaller than in the virgin, shape not so well defined, and the cavities in very old persons are almost obliterated. The cervix of the virgin is more of it included in the vaginal cavity than in the multipara or aged. It would seem that the vaginal portion becomes shorter after the birth of each child, until in the aged multipara it is entirely wanting, and in place of the projection of the virgin there is a funnel-shaped depression, terminating in the cervical cavity. There is also a marked difference in the mouth of the uterus in these three conditions. The lower end of the cervix in the virgin is truncated, and is not divisible into labia, although it projects slightly more before than behind. The os is lenticular in shape, about a quarter of an inch in extent, and when the end of the cervix is pressed upon by the finger feels like a mere dimple. After the woman has borne children, the lower end of the neck is divided into distinct anterior and posterior projections, called anterior and posterior lips, the front being a little longer than the posterior. The os extends entirely across the lower end of the cervix, and is large enough to almost admit the tip of the index finger, forming the appearance denominated the os tincæ, or fish mouth.

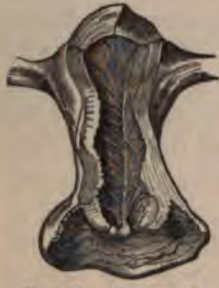


FIG. 30.—Uterus of a Child.

The cervix is situated centrally, with reference to circumference of the pelvis, and the end of it is behind, and very slightly below the level of the arch of the symphysis, so that the finger reaches it by being passed directly backward from the vaginal orifice. In the multipara it is often a little below this point. The uterus is dense and almost hard as cartilage, the cervix not quite so firm to the feel. When the substance of the uterus is cut into, it seems formed of a confused assemblage of vertices—if viewed with a magnifying glass, of rudimentary fibres—while in many places may be seen the minute orifices of sinuses, quite patent and perceptible to the naked eye: covering this is the peritoneal membrane. From the outer wall of the abdomen the peritonæum is reflected upon the bladder, which it closely invests, passing over the top, around the body, and down behind. From the side and posterior part of the bladder this membrane is continued upon the uterus, dipping down between the two os uteri, rather below the junction of the body and cervix; arising from this point it reaches the fundus, passes over it down the back of the uterus on to the vagina for an inch and a quarter or an inch and a half, it is reflected backward to cover the rectum, and lie continuous with the portions forming the mesentery, and covers the posterior wall of the abdominal cavity. The fold of membrane passing from the bladder to the uterus is called the vesico-uterine ligament, as it serves to bind these two organs together. From the central layer just described as investing the bladder, uterus, and rectum, there is a broad expansion that reaches from the sides of these viscera to the circumference of the pelvis, called the broad ligaments of the uterus, the expansion on either side being regarded as one ligament. This tent-like expansion in the ordinary condition of things is sufficiently tense to remain a firm covering to the cavity of the pelvis below, and retain the uterus in its central position. But the upper surface of the broad ligament is not a plane; for at the side of the bladder is a deep fold, especially when this organ is empty. Behind this point, and between the side of the uterus and the side of the pelvis, is an elevated, or rather prominent duplication, in which is contained the round ligament, Fallopian tube, and the ovary and its ligament on either side; behind these there commences a depression which is continued down into the posterior part of the pelvis nearly upon a level with the deflection from the vagina to the rectum. This last disposition of the peritonæum forms a deep pouch, the more depressed or bottom part being central, while at the sides it becomes gradually more shallow. This is the recto-vaginal cul-de-sac, or the cul-de-sac of Douglas. It is capable, when the parts are *in situ*, of holding two ounces of fluid. Again, the most prominent part of the lateral ligament is traversed by those elevated lines, caused by the presence of the round ligament in front of the Fallopian tube in the centre, and the ovary and its ligament behind, and between these are depressions.

Although the peritonæum closely embraces the uterus, it is not difficult to dissect it off. The adhesion is very intimate before and behind, but at the central laterally, where the two layers meet as they come around from before and behind, the adhesion is so slight that it may be separated from the uterus by the finger. In fact the connection between the uterus and appendages and the peritonæum is precisely the same in character as with the abdominal viscera. The ligamentous expansions of the peritoneal membrane are everywhere strengthened by fibrous tissue. Tissues from the uterus pass quite liberally out to the two layers that meet at its sides, and thicken and strengthen them very decidedly. A large amount of connective tissue, also, is found between these layers, and is continued on the under surface of the peritonæum everywhere in the pelvis, giving it strong and intimate connection with the viscera on the one hand, and the sides of the pelvis on the other. A like important supply of connective fibres bind the sides of the vagina to the circumference of the pelvis, rectum, bladder, etc. The bladder is also held firmly in contact with the lower part of the muscles of the abdomen and pubis and vagina by the same efficient medium. As has been remarked by Dr. Savage, the connective tissue is probably the most important part of ligamentous material in the cavity of the pelvis, and by firmly connecting the vagina with the solid pelvis renders it an efficient base of support to the uterus. I think a like remark may be made in reference to its potent agency in strengthening the broad ligaments. The peritoneal membrane alone would not have much power to support the pelvic organs, and I doubt not but that the connective tissue is the main agency in this respect. But the uterus has another ligament, called the round ligament. It is fibro-cellular in structure, reaching from the anterior angle of the fundus uteri—where it is continuous with the fibrous structure of the uterus—to the external abdominal ring, where it becomes blended with its fibrous margin in part, some portions passing out of the pelvis and being lost in the substance of the mons veneris, and other fibres extending down into the dartoid cavity of the labia on either side. There are, in addition to the cellular and fibrous material entering into the composition of the round ligaments, blood-vessels, nerves, and lymphatics. There are two round ligaments, one on either side, and they lie in close contact with the bladder when that organ is distended, making pressure upon its sides. It is strong, and keeps the uterus from being pressed backward by the weight of the distended bladder, and steadies it against other forces acting in that direction. It is closely enveloped from one extremity to the other by the peritoneal membrane, in the fold of which—the broad ligament—it forms a prominent ridge. The round ligament is much thicker and stronger at its uterine than its external extremity.

The Oviduct, or *Fallopian tube*, is the organ of communication between the uterus and the ovum, serving at once as a viaduct for the seminal animalcula to the ovary, and the ova from the ovary to the uterine canal. It is from four to five inches long, one end terminating in the upper corner of the cavity on each side of the uterus, being embedded in the fibrous tissue of that organ at the angle between the fundus and body, to which the other extremity is applied, and a small part of it adheres to the ovary. It is trumpet-shaped and hollow, the cavity of the small or uterine extremity measuring about the sixteenth of an inch in diameter; from this the tube gradually dilates, and near its outer or ovarian extremity measures from one quarter to a half inch in diameter. Immediately at the ovarian extremity it is somewhat constricted, so that its mouth or opening is not more than one quarter of an inch in diameter and round. This extremity is surmounted by a fringe of digital-shaped projections, each projection being near half an inch in length, and the size of a very small sewing-needle when turgid and erect. They are attached to the extremity of the tube, and do not seem to be continuous with, or of the same character of tissue with the tube. The ends attached to the tube are closely applied to each other all around, but the other ends are separated, and stand out from the central line in such a way as to expand the whole ring very widely. If we measure across the fringe-like or fimbriated expansion of the Fallopian tube, we will find it about an inch from the extremities of the one side to the same points on the other. The fimbriæ are held together by a delicate connective tissue. Their structure is spongy, and they are capable of erection, so that they spread all over the surface of the ovary, to which they are held in forcible contact by the adhesion of one of these projections, thus being in a position to apprehend the ovum as it emerges from the sac. This erection is probably constant during the menstrual molimen, as a circumstance that insures the passage of the ovum into the uterine cavity. The main substance of the oviduct is fibrous, there being two sets: the longitudinal, which for the most part are external, and the circular, internal to this layer. Outside of the fibrous portion is the peritoneal or serous covering, that embraces it closely, and extends from the uterus to the fimbriated extremity, where it terminates. This termination of the peritoneal covering leaves the open extremity of the oviduct to communicate with the peritoneal cavity.

The Fallopian tube is lined by a delicate mucous membrane extending from the mucous membrane of the uterine cavity to the fimbriated extremity, where it terminates. It is thrown into longitudinal folds, quite prominent when the tube is in a state of ordi nary contraction, but becomes very much less, and in the larger part effaced, when the tube is inflated. The Fallopian tube is supposed to be endowed with peristaltic action, the motion being toward the uterus. The Fallopian tubes occasionally have two circles of fimbria, one at the ovarian extremity, and another near the uterus. The second fringe may be within half an inch of the other, or more than an inch from it. Wherever this second circle may be, however, there is also an opening into the tube, through which the ovum might pass if it should come within reach of the fimbria. The other uterine termination is not always constantly the same. Sometimes it bifurcates within the wall of the uterus, one portion of the tube traversing the length of the side of the organ, terminating on the extremity of the cervix.

The Bodies of Rosenmüller is the name given to a number of canalicula that may be seen by means of strong transmitted light in the broad ligament near the outer end of the Fallopian tube. They are very minute in size, contain a little serous fluid, and as yet they are not traceable to any other organ, nor has there been discovered any excitory orifice. Their function, if they have any, is not yet decided upon, and the probability is that they are rudimentary analogues serving as a link of the likeness by which all animal nature is bound together.

The lining membrane of the uterus is regarded by anatomists now as mucous in structure, although quite peculiar in some respects. Its secretion entitles it to be thus classed at least. Examined with a strong magnifying instrument, the surface is thickly covered with minute depressions, so small as to make an enumeration of them exceedingly difficult. The depressions are the funnel-shaped openings to minute tubes that extend from the free surface through the whole thickness of the membrane, and with the other end are planted upon the fibrous structure of the uterus. The inner surface of the membrane is covered with an exceedingly delicate epithelium which dips down into the tubules or follicles as they are sometimes called. The main substance of the membrane is, therefore, formed of these follicles, or tubes, standing very close together, and maintained in that position by attenuated connective tissue. It is very closely and firmly attached to the fibrous portion of the uterine walls, both by connective tissue and the extremities of the minute tubes being slightly embedded into its substance. In the central parts of the posterior and anterior surfaces of the inside of the cavity the mucous membrane is one-third the thickness of the whole substance. It gradually becomes thinner towards the Fallopian tubes and the cervical orifice. It is deeply and thickly plaited at the former places, which to the naked eye makes it have the appearance of being fissured. When the membrane is cut in making an incision through and perpendicular to the wall of the uterus it appears striated, on account of the arrangement of the tubules above described. The mucous membrane of the cervix differs decidedly in its structure from that of the corpus uteri. In the neck it does not materially differ from the formation of mucous membrane elsewhere, and is peculiar only in having numerous large mucous follicles, called the glands of Naboth, looking like little ova scattered about over its surface, on account of the transparent thick mucus contained in their open mouths. They were regarded by Naboth, their discoverer, as the ova from which the embryo was produced. It is much thinner than the membrane of the cavity, but it is also plicated. The folds assume a penniform arrangement on the anterior and posterior walls. This

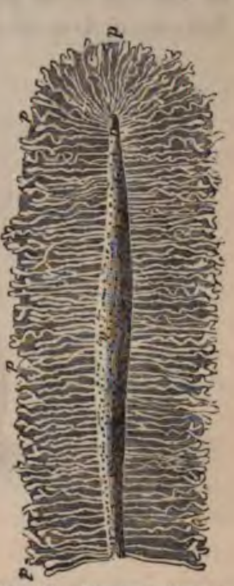


FIG. 31.—TUBULAR STRUCTURE OF THE UTERUS.—*a a a.* The Cavity of the Uterus showing the open mouths of the Follicles. *d d d.* The extremities of the Follicle next to the fibrous structure of the Uterus.

appearance was dignified by the name of arbor vitæ by some ardent observer of the beauties of anatomy. The mucus secreted in the cervix is produced, for the most part, by the glands of Naboth, and is of a thick glairy character, and very tenacious,

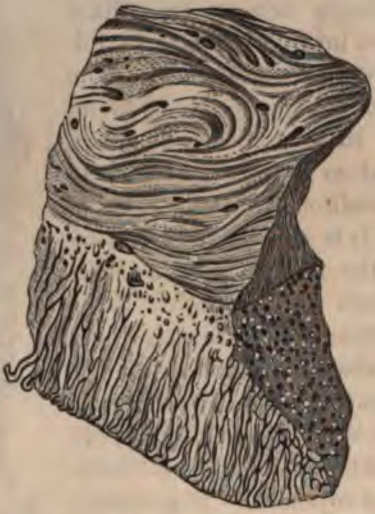


FIG. 32.—Exhibits the Fibrous and Glandular Structure of the Uterus, after Costé.

and alkaline in chemical reaction. The secretion in the vagina is thinner, less tenacious, and acid in chemical reaction. When both are produced in superabundance, and mixed as they pass through the vagina, the cervical mucus is coagulated into minute curds, and swimming in the transparent vaginal secretion gives it a milky or creamy appearance. The arteries of the uterus are derived from the ovarian and hypogastric. They enter the sides of the uterus between the two layers of the broad ligament, where they pass down towards the cervix from the fundus. They are small in the unimpregnated organ. After penetrating the substance of the uterus, they divide into numerous branches, which are again subdivided, and after traversing the walls around, upward and downward, their capillary divisions penetrate the mucous membrane, and distribute themselves about the tubules of that membrane. Each tubule seems to be supplied with an arterial capillary that runs along it to its epithelial extremity, where it terminates in the venous capillary. This last travels along the tubule on the opposite side from the artery to its termination in the uterine substance, where it joins other capillaries to become a venous ramuscle. The veins are formed at and beneath the mucous membrane, becoming larger by the accession of more twigs, until after traversing the uterine substance to the side they emerge from the organ and become the uterine veins. The veins in the substance of the uterus are sinuses or channels, lined with the lining membrane of the veins without having the external coats. The veins and arteries both thus pursue a circuitous route between the two surfaces. The nerves are derived from the sympathetic and spinal systems, the former being most abundant in the body, and the latter in the cervix. That portion of the cervix below the vaginal attachment seems to have but little nervous endowment, while the portion above the vaginal attachment is abundantly supplied. The sympathetic nerves are derived from the renal and hypogastric plexuses, with some branches from the sacral plexus. The lymphatics are also numerous, and proceed to the lumbar and renal lymphatics.

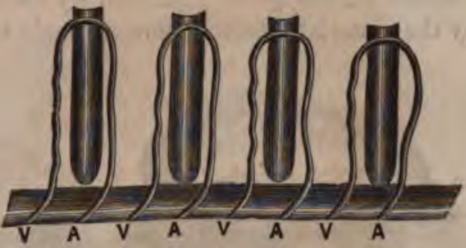


FIG. 33—Shows the relation of the capillaries to the tubules in the mucous membrane.

The uterus is occasionally wanting entirely, at other times rudimentary in size and incapable of any function. Sometimes it is double, having a partition in the centre, with corporal and cervical cavities, and two mouths; again there may be two cavities to the body emptying into one cervical canal. In either case one Fallopian tube communicates with each cavity. One of these cavities may be impregnated, and the other remain empty. The partition between the uteri may be extended along the vaginal cavity, and thus divide this tube for its whole length.

OVARIA.

The ovaria are sometimes called the female testicles, because they are the source of the germ furnished by the woman to be fecundated by the material received from the male testes.

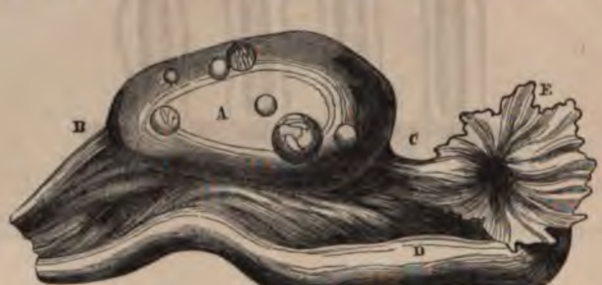


FIG. 34.—OVARY OF A YOUNG FEMALE AFTER PUBERTY.—A. Body of Ovary. B. Utero-Ovarian Ligament. C. Tubo-Ovarian Ligament. D. Fallopian Tubes. E. Fimbriated extremity of Fallopian Tube.

Their bulk consists of a stroma, or parenchymatous substance formed by the interlacement of fibres, called by M. Sappey muscular fibres. The intertwining of this fibrous material forms interstitial cells likened to spongy substance. The recent researches of M. Sappey, given by M. Tanier in his edition of Cazeau's Obstetrics, go to show that the stroma is not uniform throughout the whole substance of the ovaria. The outer or peripheral portion surrounding the whole is of a lighter color, and rather more condensed and firm in consistence than the inner or central part. This last is darker in color, more loose and spongy in texture. In the outer layer, which is one twenty-fifth of an inch in thickness, are contained the rudiments of the ovi, and it is named by him the ovigenous portion. He calculates that each ovary contains over three hundred thousand of these germs. The central part of the ovary does not seem to contain any of these, and may be regarded as merely the core around which the fruitful portion is developed and spread out.

The stroma is enveloped in a thin, elastic, fibrous capsule, which contains and gives shape to the organ. In addition to this, the ovary is invested by the peritonæum, except at its sharp or lower edge. The former covering is inseparable from the stroma, and seems to be the source of the origin of the fibres that run in every direction through the organ, as before mentioned. The arteries are called the ovarian arteries, and correspond to the spermatic in the male. They enter the ovary at the edge where the peritoneal covering meets, pass into and pursue a tortuous or a curling course, the twigs supplying the ovigenic portions as they ramify in every direction toward the surface. The veins, after emerging from the substance, form quite a plexus between the layers of and beneath the peritonæum.

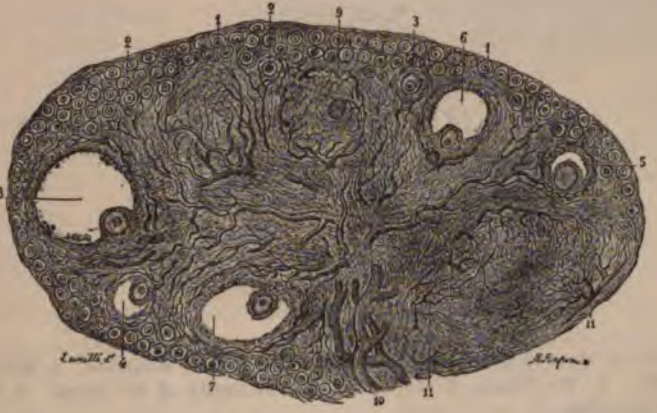


FIG. 35.—LONGITUDINAL SECTION OF THE OVARY OF A CAT.—1. Rudimentary Ovisacs scattered about through the tissue. 2. Ovisacs more advanced. 3. Ovisacs more advanced, in which the granular matter is perceptible. 4, 5, 6, 7, 8. Still more advanced Ovisacs, in which the granular matter and ovum are apparent. 9. An outer Ovisac, in which the ovum is seen through the membrane. 10. Great vessels of the Ovary. 11. Minute ramifications of these vessels.

Ovisacs or *Graafian Vesicles.*—When the girl arrives at puberty, the dividing line between childhood and womanhood, the ovaries, instead of being smooth, have some round elevations on the surface. These elevations correspond to the ovisacs, which may be discovered by making an incision. They are vesicles filled with transparent and somewhat tenacious fluid. At this period there may be counted from twelve to twenty in each organ, varying from a mere visible cavity to the size of a pea.

There are two ovaries, one on either side of the uterus. At the age of puberty they are situated very nearly in contact with the sides of the pelvis, just anterior to the sacro-iliac junction and very slightly below the brim of the pelvis. In fœtal life and early infancy they are entirely above the pelvic cavity, and during pregnancy they are elevated high up into the abdomen with the rising uterus, and are closely applied to the sides of that organ. They are somewhat oval in shape, compressed or flattened, the lower edge being thinner than the upper. They are comparatively large in the fœtus and young infant, do not grow much in childhood, but become larger at puberty, and remain so during the child-bearing age of woman, while the senile ovary is so much atrophied as to be scarcely recognizable. They are bound to the uterus by a strong fibrous cord, called the ovarian ligament, and retained in their places by this connection with the uterus in part, but mostly by the broad or peritoneal ligament, in one of the folds of which each is embraced on either side and covered as before mentioned. They adhere to a very small part of the fimbriated extremity of the Fallopian tubes.

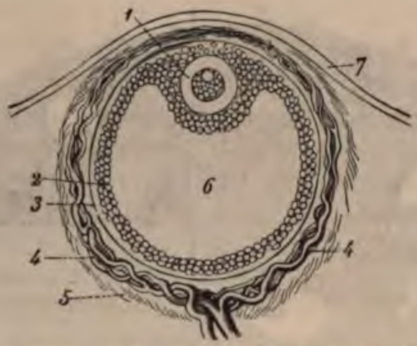


FIG. 36.—A MATURE OVISAC.—1. The Ovum. 2. Granular Membrane. 3. Wall of the Ovisac. 4. The Vessels of the Ovisac. 6. The Cavity of the Ovisac. 7. Peritoneal Covering.

Anatomy of the Ovisacs.—When matured and ready for the discharge of its contents the ovisac is a fibrous capsule containing the ovum and associate material. The wall is compared to the tissue of the fibrous stroma of the ovary, which is condensed into a membrane thin but firm. On the inner or cavity surface of this envelope is a layer of granular matter thicker than the investing capsule itself, called the granular membrane. The granular membrane is somewhat tenacious but not very firm, and is continuous all round. At the side of the ovisac nearest the surface of the ovary, and incorporated into the granular membrane, there is a mammary-shaped accumulation of the granules, of a thickness amounting to about the fourth of the thickness of the cavity, the proligerous disc. Within this accumulation of granules is contained the ovum. The interior of the ovisac is filled with a limpid viscid fluid, in which are floating granules like those forming the granular membrane, and fatty globules.

The ovum, or ovule as it is also called, is about one-tenth of a line in diameter, and is comparable, in general construction, to an egg, and hence is called the ovum. When viewed by a light transmitted from a mirror through it into the microscope, it has the appearance of a round ring. The outside is a white, "pellucid zone," very notable in thickness. This is believed by some to be a membrane, and is likened to the membrane inside the white of an egg covering and containing the yolk—the yolk membrane—while others regard it as analogous to the albumen or white of the egg. It is probably composed of both these different parts, the membrane investing the albuminous portion—the albumen itself, and the yolk membrane immediately surrounding the yolk. However this may be, all the transparent fluid inside the ring is essentially the same as that contained in the yolk of the egg. It is transparent, and of a slightly yellowish tinge. Near the ring, at one side or the other, within the yolk, may be seen a bright, transparent vesicle, called the germinal vesicle. The germinal vesicle is about the one-sixtieth of a line in diameter. Inside of the germinal vesicle again may be seen a spot or point more obscure than any other, apparently granular in form, called the germinal spot. The granules surrounding the ovum, forming the proligerous disc, so tenaciously adhere to each other and to the ovum that when the latter is discharged it is surrounded as it passes out, and carries with it, a large part of the disc.

Ovulation.—As I have before said, some of the ovisacs are quite large, and one is larger than any of the others; it approaches maturity, and is very near the suface of the ovary. It continues to grow by an increase of its contents until it projects from the surface of the ovary very prominently, appearing more than half as large as all the ovary besides. At this time the most prominent portion of the investing membranes becomes very thin, and the attenuation becomes greater as the size of the tumid ovisac increases, until finally, no longer capable of retaining its accumulating contents, it bursts, and the ovum, with a large part of the granules of the proligerous disc, and much of the other fluid, escape upon the surface of the ovary and within the grasp of the fimbriated extremity of the Fallopian tube. Before the rupture of the ovisac, the ovary is very much enlarged; soon as the discharge has taken place the ovisac collapses to not much over half its former size, and the ovary appears very much less in a few hours. At the end of a month from the time the first bursts another has been matured and has discharged its contents; in two months after, another; and so on they mature and disappear, from month to month, until the original number are all gone. During this time more are being developed out of the microscopic germs of the stroma in such numbers as to keep up the supply. Attendant upon the phenomena that precede and accompany the rupture of the ovisac and discharge of the ovum is a universal turgescence of the genital organs; from the greater labia to the fringes of the Fallopian tubes the organs are gorged with blood. If inspected, the mucous membrane of the vulva, vagina, and uterus are

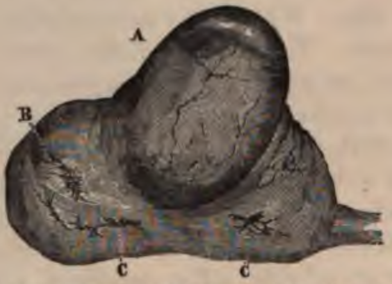


FIG. 37.—THE OVISAC JUST READY TO RUPTURE.—A. Ovisac of its natural size. B C C. Cicatrices left by previously ruptured Ovisacs.

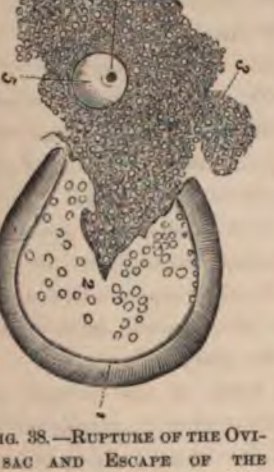


FIG. 38.—RUPTURE OF THE OVISAC AND ESCAPE OF THE OVUM.—1. Ovisac. 2—3—6. Granular matter. 4. Germinal Vesicle. 5. Ovum.

seen to be livid in color and moistened with a superfluity of mucus. The congestion is so great as to decidedly increase the size of the uterus and render it more soft to the feel; while the mucous membrane is thrown into folds and crowded together so as to fill up the cavity. The antero-posterior diameter of the uterus is more increased than any other. When at the height of congestions, the capillaries, winding around the long mucous follicles of the cavity of the uterus, become so distended with blood as to be singly visible through the delicate epithelium, and in consequence of their peculiar arrangement, separating lozenge-shaped spaces of the membrane cause a beautiful tesselated appearance. This forcible and extreme distention becomes so great that the fragile walls of the capillaries suffer from it, and microscopic fissures make their appearance, through which, at first, minute quantities of blood escape, and, after a while, a copious effusion occurs, filling up the cavity of the uterus, flowing into the vagina, and finally, showing itself externally, announces the appearance of the menses. Whether from the depletion thus brought about, or the removal of the focus of irritation, by the discharge of the contents of the enormous ovisac, the congestion gradually sub-

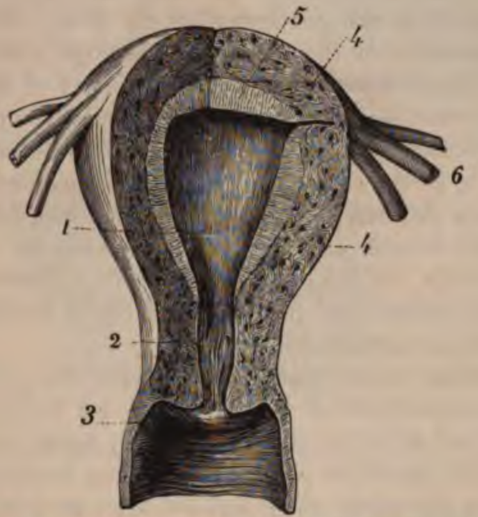


FIG. 39.—SECTION OF THE UTERUS AT THE MENSTRUAL EPOCH.—1. Uterine Cavity. 2 and 4. Muscular tissue and orifices of vessels. 5. Mucous membrane. 3. Vagina. 6. Fallopian tubes.

sides, the organs resume their natural size, and recover their wonted hue. Of course, as an accompaniment of ovulation, menstruation recurs, with the return of each month, contemporaneously with that process. We are not in possession of facts that enable us to say whether the escape of the ovum takes place at the beginning, during, or at the conclusion of the flow. We only know that the appearance of the menstrual discharge is an evidence of impregnability, because it is an accompaniment of the discharge of a mature ovum which is susceptible of being fecundated. Yet while menstruation is a sign of ovulation, it does not invariably accompany it, hence we cannot be sure that a woman is not capable of bearing children because she does not menstruate; for, in fact, many do become pregnant without having the monthly discharge of blood. On the other hand, a woman cannot menstruate who does not ovulate, and discharges of blood prompted by any other cause is not menstruation.

But to return to the empty ovisac. After the collapse of the sac and the subsidence of the congestion, we find it patulous at the point where the ovum escaped, and the lining membrane, on account of the retraction of the surrounding stroma, thrown into folds, so that the whole inner surface is rough and uneven, and the opposite sides present to each the tops of the folds or duplications until the cavity is partially filled up. A part of the granular matter and viscid fluid remains, and are colored with blood sometimes, or otherwise stained until it is yellowish; this collapsed ovisac is what writers denominate the corpus luteum or yellow body. Observers do not agree as to whether the yellowness is caused by blood or by material like the yolk of an egg.

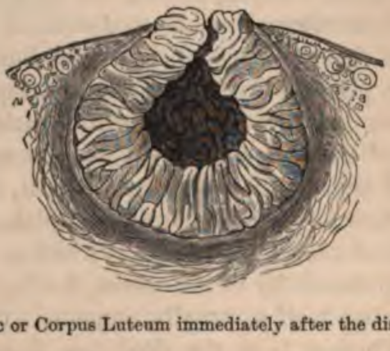


FIG. 40.—An Ovisac or Corpus Luteum immediately after the discharge of the ovum.

There is no doubt that blood is sometimes effused into the cavity from ruptured capillaries, as a solid clot fills up the cavity; it is equally well established, I think, by M. Coste that the blood is not always found there, yet the inside of the cavity is yellow in these last cases.

In a few days after the collapse of the ovisac the edges of the rupture adhere, and the cavity is closed up. The continued retraction of the surrounding parts lessens it still more; the effusion of plastic material inside causes the walls to adhere, and at the end of a month there is in place of it a somewhat dense substance surmounted by a cicatrix, and at this point the ovary is flattened and slightly puckered. After many repetitions of these processes, the ovary is puckered and scarred over a large part of its extent, and after the change from the child-bearing to the senile condition, they are reduced to ill-shaped and diminutive masses scarcely recognizable.

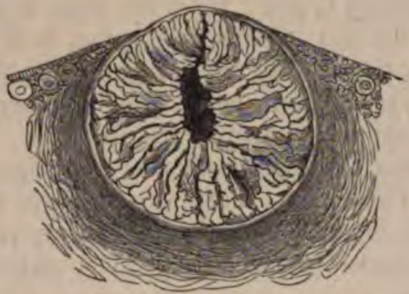


FIG. 49.—An Ovisac or Corpus Luteum, several days after discharge of Ovum.

This description of a corpus luteum is applicable to the virgin and non-pregnant condition generally. If, however, the ovum that escapes is fructified, a very different destiny awaits the empty ovisac, and it becomes the corpus luteum of pregnancy; and I think the intimate cause of this difference is to be found in the fact that the congestion of menstruation does not subside if the ovum is fructified, or if it does subside, there is very soon renewed congestion. All the genital organs, instead of subsiding into their former condition, increase in vascularity and remain turgid and swollen. Especially are the uterus and ovaria swollen. This continues until in a short time it merges into hypertrophy and the uterus and ovary grow larger, acquiring more substance. The

LANE LIBRARY

corpus luteum empty cavity of the ovisac correspondingly increases in size for several weeks. There is not the solid retraction of the stroma around it, but all the parts are spongy and soft. The opening does not grow together for four or five weeks, and the adhesions are not completed, according to M. Coste, under forty days. All this time the general bulk is increasing, until at the end of six weeks the tumor is solid and compact, nearly an inch long and five-eighths wide.

It remains stationary until the end of the third month before it begins to diminish in size. From this time it gradually grows less until near the end of pregnancy before it is entirely lost in the surrounding tissues. Its retrogression is not always uniform; in some it disappears before labor, while in others remains of it may be discovered several months after labor.

As before remarked, menstruation is contemporaneous with, if not the effect of ovulation. These two processes make their commencement in young girls from ten to twenty years of age. I have known a number of instances in which girls menstruated at ten, and all must have met with cases where the other extreme was reached; perhaps the average in temperate climates is the fifteenth year. The menses is not always completely established when it first appears, as often, there will be intervals of many months after the first occurrence, or even after it has appeared several times it may intermit for an uncertain length of time. As the stature and organization attain perfection in size and shape, and the vital energies are fully established, the function of ovulation and its attendant phenomena are regularly brought about. The periods are not all the same in different individuals of like soundness and organic perfection, so far as we can learn from our means of observation. Some are unwell every three weeks, others every four weeks, and again others every thirty days. Even this latitude of limitation does not include all cases; some menstruating at shorter intervals and some longer. A singular instance of this kind has been within my knowledge for four or five years. The patient assures me that she has never menstruated oftener than once in ninety days, and she sometimes goes twice that time, with regularity as to the multiplication of thirty days. Her flow is about five days, and she requires from ten to fifteen napkins. Nearer the age of forty-five than any other in this climate, the menses cease to recur, and the function of ovulation is no longer

YAARBIJ 3MAJ

performed. The cessation is sometimes sudden and complete, the patient menstruating as usual the last time, and having no premonitory signs. Generally, however, there are intermissions of some months, and then a recurrence somewhat regularly, or even irregularly, followed by no return at last. Many persons have the change of life years before this time, while others menstruate up to sixty years. I witnessed a singular recurrence of ovulation in a woman fifty-two years of age, who had not menstruated for eight years. She had an acute attack of hepatitis, for which she was bled, blistered, and salivated,—the usual practice a quarter of a century since. After her recovery she became very robust, menstruated, and in nine months afterward gave birth to a vigorous son. As a presumptive evidence that ovulation had not taken place during the eight years that her menses were absent, she had not been impregnated, although, as I was assured, cohabitation had been indulged in with the same unreserve as after her recovery from the inflammation of the liver. The quantity of the discharge will probably average eight ounces; but very great difference obtains in this respect also, all the way from a mere show to twenty and even thirty ounces. We should therefore often be deceived, if we attempt to form a correct idea of the health or deviation in individual cases by the standard of average mentioned. The best way to determine whether a woman is menstruating normally, is to compare her own history in this respect. She should continue the quantity through life with which she begins, that is, if in the first two years of girlhood she loses fifteen ounces and continues to flow five days, this would be her rule in the future. But some allowance must be made for circumstances befalling her. Marriage, I think, usually increases the quantity; so does bearing children.

Plethora has some effect, no doubt, in causing greater quantity of the flow. The ingenious method mentioned, and, so far as I know, originating with Dr. Meigs, will enable us to form a proximate result as to the quantity. Women generally wear folded napkins closely applied to the vulva, replacing them when saturated with blood; and Dr. Meigs considers one of the napkins equal to the absorption and retention of an ounce of the menstrual fluid.

It has already been stated that the capillaries of the mucous membrane of the cavity of the uterus are the source of the discharge, and that it is extravasated through minute fissures; if this be true, it is of course blood. But there is a large admixture of mucus, which gives it a peculiar tenacious and stringy appearance, especially for the first and last few hours of the flow. It is observed that when not very abundant it does not ordinarily coagulate; but when the quantity is great it is frequently "clotted." The non-coagulation depends on the presence of the acid secretion of the vagina, rendering the fibrin incapable of coagulation. The color of the discharge, being much darker than venous blood, in all probability is caused by the resistance to the action of the oxygen of the atmosphere, on account of the imperviousness of the tenacious mucus. I do not consider menstrual disorders as belonging to the subject of obstetrics, and hence refer the reader to works on diseases of women.

GENERATION.

Generation is effected by the joint action of the two sexes—the female furnishing the germinal ovum, the nidus, and material for its development, while the fructifying principle is derived from the male. The result of copulation and the union of the two materials thus furnished is conception.

Conception.—In order to understand more fully the *modus in quo* of conception, it is necessary for the reader to consider somewhat in detail the more intimate facts of the results of coition. The semen, containing the spermatozoa, is injected into the upper part of the vagina in contact with the cervix uteri, perhaps not into the cervix, at least it certainly is not necessary that this should be the case, as now it is well understood by the profession that conception may take place without complete penetration of the vagina, and it is enough that a very small amount of semen be deposited upon the mucous membrane of the vagina. The forces by which the spermatic animalcula are conveyed to the point of contact within the genital organs of the woman are believed to be vermicular action of the cervical canal, drawing the semen within, ciliary and vibrional. I have not met with an account of experiments that satisfy me of the manner in which the animalcula travel toward the ovaria; but a little observation of the great activity with which they swim—for the appearance seems to me to justify the term—through the seminal mucus in which they are ejected from the urethra, enables me to understand that *they have* the capacity to move through the space between where they are deposited and the ovary. The vermicular motion of the uterine cavities is not so well proven as this, and the ciliary motion is in the opposite direction. I think we may conclude that these entities, for they are not properly independent beings, although they have very much the appearance of it, through their motion diffuse themselves over the mucous membrane in every direction, swimming through the mucus on its surface; and that some of them find their way through the Fallopian tubes to the surface of the ovaria. However it is done, they do attain to the surface of the ovary, and have been seen actively wriggling about through the moisture of that organ, ready for contact with the ovum so soon as it escapes from the ovisac; and ovarian pregnancy can be accounted for much better by supposing that they occasionally penetrate the ovisac, and affect the ovum before it is discharged, than any other way. Whether the contact occurs on the ovary always, or occasionally in the ovarian tube, or even in the uterus, is a matter of conjecture only, and of but little importance; probably oftener on the ovary, but not invariably. What

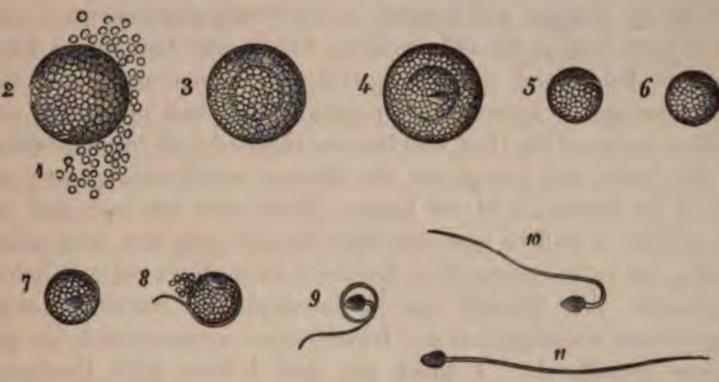


FIG. 50.—PROGRESSIVE DEVELOPMENT OF THE HUMAN SPERMATOZOA.—1. Spermatic granules. 2. Large spermatic cell containing granules. 3. Large cell containing the beginning of the formation of a spermatozoon cellule. 4. The same, with a spermatozoon in process of development. 5. The cellule with the spermatozoon isolated from the large cell. 6. More advanced stage of formation. 7. The same, with the spermatozoon more developed. 8. Rupture of the cellule. 9. Spermatozoon more advanced. 10. Still more perfect. 11. The fully developed spermatozoon.

the nature of the contact is, has also been a fruitful theme for speculation. One party believes the ovum to be a cell, and the spermatozoa to be cells also, and that when they come in contact the latter is changed, possibly bursted, and its contents imbibed by the ovum, or that the impression is exerted on the ovum that sets up the changes which result in embryonic phenomena. Another party revives the old doctrine, which was thought to have been exploded and disproved, that the animalcula enter the ovum through a microscopic opening, which had previously existed or occurs at the time, and become blended with the substances of the ovum, and inaugurate the changes which subsequently result in the formation of the fœtus. From what has been said on the subject, it will be seen that fructification does not take place during the sexual connection, but some time afterwards; it being impossible that contact can be accomplished instantaneously. But, contact accomplished and fructification consummated, has the woman conceived? I think not, and believe with Professor Meigs, that until the ovum has contracted attachments that will secure its future development, the process of conception is not complete; for if the fructified ovum does not find a lodgment, the person will not be pregnant as the result of that seminal contact, and, indeed, it is likely that many cases of barrenness are caused by the unfitness of the uterine mucous membrane to readily partake in the changes necessary to detain the ovum until vascular union is accomplished between the two. We now reach the conclusion that conception is effected by a series of processes: the locomotion of the spermatozoa, the contact, fructification, the change of place by the ovum from the ovary to the uterine cavity, and its fixation in the uterus; and that several days must elapse after the successful coitus before conception can be said to have taken place. The time of the month when fecundation is most probable is while the ovum is in the organ, and after it has been discharged from the ovisac, and seems to be very soon after menstruation—the first eight or ten days; but there are many reasons to believe that some women are susceptible at other times, and probably at any time.

Pregnancy.—After the woman has conceived she is pregnant, and there commence a multitude of changes in the maternal organs, which are brought about for the accommodation of the little inhabitant. If the congestion of menstruation has subsided, the vessels are again injected and all the organs of generation are rendered turgid with blood. The congestion is especially great in the uterus, and particularly that part of it to which the attachment is formed. If the attachment is made to the right side of that organ, that side will be more intensely colored, softer, and larger than the left. This congestion does not subside during the whole term of gestation, but continually increases. This very great attraction of rich blood to the uterus is probably the means employed to stimulate and effect hypertrophy in the tissues of the uterus. However this may be, all the constituent elements of that great organ immediately commence a development that results in a complete change in their properties. Muscular fibres that are microscopic and imperfect in formation, and feeble in strength, become distinct, visible, and gigantic in proportions and strength. The nerves, before hardly demonstrable by any means, are deployed into massive plexuses; while the arteries and veins, which were mere threads in dimension, become great channels for the conveyance of floods of fluids. The first increase in the size of the uterus depends simply upon the vascular engorgement, the second upon the hypertrophy of tissue. The increase of size from hypertrophy is greatest at first in the antero-posterior direction, so that at the beginning of the third month after conception the uterus measures about two inches and three-quarters in all directions—having increased in the antero-posterior diameter an inch and a half, none in length, and perhaps less than an inch transversely. We can easily understand this, when we remember that in the unimpregnated state the anterior is in contact with the posterior wall. This proportion is continued until, the beginning of the fourth month, the uterus measures three inches and three-quarters in all directions. From this time it gains more rapidly in the longitudinal diameter. In the sixth month it is eight and three-quarter inches long, six and one-quarter wide and thick. At nine months the organ measures twelve inches or more in length, about nine inches wide, and not quite so thick. In the first four or five months of pregnancy it is round almost, and becomes broader and somewhat flat in the latter months, the anterior wall much more convex than the posterior, and by inspection it will be seen that the anterior wall is more developed than the posterior: the origin of the Fallopian tubes, which is about central in the unimpregnated organ, is very much behind that point at the end of utero-gestation. From the time the uterus is decidedly increased in size it settles below its ordinary position, and in the second month it rests on the perinæum, with the fundus generally inclined backward toward the sacrum. Occasionally the fundus is turned forward toward the pubis and rests upon the anterior column of the vagina. In this depressed position it remains until by its bulk it fills up the excavation, the fundus, by virtue of its increase of size, becoming more elevated. At the end of the fourth month the fundus is again at the superior strait, while the cervix still rests upon the floor of the pelvis. The upper part of the pelvis soon becomes quite full, and the fundus rises sufficiently above the brim to be felt through the abdominal walls, and its most salient parts, near the origin of the Fallopian tubes, project above the ilio-pectineal line at the sides. At this time the lower part of the pelvis is not so completely filled by the cervix and body. The uterus, if looked at from above, will appear to be developed into a wedge shape—the fundus representing the large end, and the cervix the small end of the wedge. The bevelled sides of this wedge-shaped substance are at this time applied to the edges of the brim at each side of the pelvis. In this position and shape the uterus cannot increase in size without wedging itself up into the abdominal cavity, and this it does so completely that at the seventh month the cervix is almost if not quite elevated to the superior strait. This process of elevation is sometimes commenced with a jerk, so that the patient is conscious of a sudden and great motion, "as though something had given way inside," causing faintness. This sudden elevation may be accounted for by supposing there is some crowding and compression of the uterus for a time, permitted by the elasticity of the parietes, until, after it has become considerable, by some movement of the body, as in stooping, the pressure of the superincumbent abdominal viscera is suddenly removed, and the uterus bounds upward. After the seventh month of gestation has elapsed, and especially during the eighth and ninth months, the lower part of the body of the uterus is developed, the abdominal cavity is filled, the viscera are packed into a small space, and the abdominal muscles and diaphragm exert a strong pressure upon the overcrowded contents, moving them toward the pelvic cavity. These circumstances urge the lower part of the uterus back into the pelvic excavation, and from this time forward there is a descent of this part of the organ, until at the time labor begins the cervix enveloping the head ought to be at the same point it occupied before conception. In rising out of the pelvis the fundus of the uterus is pressed forward against the recti muscles, passing in front of the intestines. This direction is imparted to it by the promontory of the sacrum and the anterior convexity of the lumbar portion of the spinal column. That the increase of size is a true hypertrophy is proven by an examination of the uterine parietes, and comparing them at different stages of development. During the whole time the walls of the body of the uterus remain about the same thickness. One important difference is in the density. At full term they are softer and more flexible than before impregnation. The color is darker, as there is more blood circulating through the impregnated uterus, and the glands of the cervix are enlarged, and secrete more mucus. While the above statements are true with reference to the uniform hypertrophy of the organ, I think there should be some modification of them as to the cervix. The cervix seems to be almost wholly developed during the ninth month, and not until the end of that time is the cavity entirely effaced; and some authors believe the cervix does not partake in the hypertrophy at all, but remains undeveloped up to the beginning of labor. I think, however, that the first statement is true, viz., the cervix is wholly developed during the ninth month. At the end of gestation, the walls of the cervix are not more than one-half the thickness of those of the body and fundus, and in many instances are very thin, so as to similate the feel of membrane. This is especially so when the uterus is unusually distended with liquor amni. Its contractility is less than the body, and it is very materially less vascular; indeed I do not doubt that it is partly *distended* as well as hypertrophied. The stretching or distention of the cavity of the cervix is probably the more readily brought about and accounted for by the fact that it is less fibrous in structure, and yields to the powerful pressure exerted above by the fibres of the fundus, seconded by the abdominal and diaphragmatic muscles.

The sensible changes in the cervix perceptible to the touch, as indices for diagnosis, should be studied more closely. In these changes I shall follow mostly the teachings of Stolz and Cazeau, as I have verified much of them by my own observation. The cervix becomes enlarged from congestion at first. In the primipara the os changes, as pointed out by Mr. Whitehead, of Manchester, from the appearance of a mere transverse slit, to be less regular, and is puckered and somewhat enlarged. The labia are tumid, comparatively soft, and livid in color, and in most cases a decided development of mucous follicles may be seen as little red spots, giving the idea of very minute fungi. By feeling up the cervix towards the body of the organ, the impression is received that the lower end of the cervix is larger than the upper, which is bounded by a decided constriction. The cavity of the cervix is slightly enlarged also. After the lapse of a very short time, the tissue of cervix becomes decidedly softer; this very slowly increases until, according to Cazeau, the whole substance of the lower end is softened at the fifth mouth. This softening, during the last three months, increases upwards until, at the end of pregnancy, it has pervaded the whole cervical substance. After the seventh month the cavity of the cervix enlarges from below upward, until the finger may sometimes be inserted into it, and shortly before labor the membranes may be reached in this way. The cervix of the multipara undergoes similar changes; but as it is broader, more irregular, and shorter, the changes in shape are not so easily traced, although they are decided. The cavity becomes larger than in the primipara, so that the membranes may be reached through it by the fingers earlier. During the time this expansion and softening are spreading upwards, for they always commence below, the cervix also becomes shortened, the upper and lower ends approaching until, a fortnight before labor, the internal os gives way and expands, the cavity of the cervix rapidly increases, allowing the membranes and part of the head to enter it, until, at the end of pregnancy, the lower portion of the cervix forms a flat ring at the os uteri, into which the finger will sink as a mere depression.

By this description of the changes in the cervix, it will be seen the shortening does not go on by a development of the cavity, commencing at the sixth month; but the cervix is only slightly shortened until the ninth month. During this month it is shortened, first, by an approximation of its two orifices,—the internal and external openings,—by the upper end being pressed downward until the middle of the ninth month, when the development begins from above downward, as above explained. At the end of gestation, the time when labor should begin, there is no projecting cervix to be felt, but in place of it, the head of the child, or membranous bag, covered by the attenuated walls of the greatly expanded cervix, very much thinned by the stretching to which it is subjected by the intruding parts of the ovum. The cervix settles lower down in the pelvis for the first three months of pregnancy, and is turned forward. After this time it recedes, and during the latter part of the fourth, or beginning of the fifth month, it rises gradually more and more until, at the eighth month, it is high up and very far back. At the end of the ninth month it is again low, nearly central, or a little posterior to the centre of the pelvic cavity. Indeed the os is almost exactly where it was before conception, and may be recognized as a depression, ring-like, at the bottom of which the membranes may be felt in the most dependent part of the almost uniform globular firm mass that fills up the superior part of the pelvic cavity.

Modification of the Textures.—The peritoneal envelope of the uterus is increased in quantity as rapidly as the uterus enlarges, and continues to cover it as perfectly as before pregnancy. In doing so the hypertrophy is very great; from the few square inches only, necessary to embrace the very small organ of the virgin, it is developed into almost as many square feet, yet maintaining the same thickness, elasticity, and delicacy of texture as before impregnation. It would not seem to be changed in character or properties. In this respect it differs from all the other textures concerned in the hypertrophy of pregnancy. As the uterus rises up into the abdominal cavity, the peritoneal duplicatures, called the broad ligaments, are unfolded, and lie spread out upon the sides of that organ, with the Fallopian tubes and ovaria beneath it, and pressed firmly upon the uterus. As the traction made upon the broad ligaments commences to lengthen them, they are also hypertrophied until they continue to extend from the brim of the pelvis to the fundus uteri, serving the purpose of steadying that organ, as before impregnation. The mucous lining of the uterus is most remarkably changed also. It very soon becomes double its ordinary thickness, its follicles increased very much in size, and the secretion more abundant. This increase in the quantity of the mucous membrane is so great that it fills up the cavity of the body to distention, and is then crowded into folds, on the anterior and posterior walls, in such manner as that the ovum, coming from one of the Fallopian tubes, almost certainly falls into the sulcus at the side, not often gravitating to the cervix. A magnifying glass reveals the open mouths of a large number of follicular lacunæ, scarcely discoverable before the parts had been brought under the influence of pregnancy. This is the condition of the membrane which fits it for the decidual changes that immediately are commenced as the effect of the presence of the ovum.

The ovum having arrived into the uterine cavity, it increases the vascularity and tumefaction of the mucous membrane at the point of arrest, the folds around it are crowded upon each other more closely, impinging upon one another and embracing the ovum closely. After a time the folds most closely pressed together over and around the ovum contract adhesions, and shut it in an adventitious cavity thus formed. Examined at this time, the uterine cavity, which is considerably increased in size, is not filled by the ovum and its newly acquired envelope, and the mucous membrane, at other parts than that containing the ovum, has become more smooth, its tumefaction somewhat subsided, but yet much thicker than before pregnancy, very soft and spongy in texture. The ovum continues to develop, and its embracing capsule dilates; the side most remote from the wall of the uterus, as it grows, becomes thinner, and at the middle of the second month, or beginning of third, comes in contact with opposite side of the uterus, and soon after fills up the uterine cavity entirely. During the growth of the ovum the part of the mucous membrane which embraces it becomes thin and non-vascular, and is called the reflex deciduous membrane, or decidua reflexa. The vessels and glandular structure of this reflex deciduous membrane

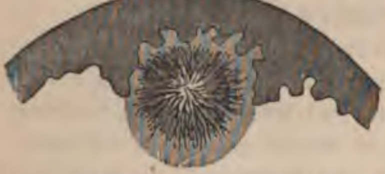


FIG. 51.—First arrival of Ovum in Uterine Cavity.

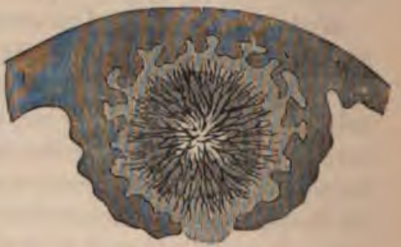


FIG. 52.

are atrophied by the pressure upon them caused by the stretching of the membrane. After the reflex decidua is distended sufficiently to fill up the whole cavity of the uterus, it presses upon the mucous membrane, in its whole extent, with sufficient force to obliterate the vessels and glandular structure in it, bringing about atrophy in its structure and causing it to become a transparent exfoliating epithelium. In this condition this last is called the real deciduous membrane, or decidua vera. Before pregnancy terminates the two do not coalesce, but adhere quite firmly together, and are discharged as one membrane. At the time the uterus empties itself of its contents there is a new mucous membrane formed beneath the exfoliated one. It will be seen that the mucous membrane of the uterus has entered into the structures of the ovum, and been sacrificed for the defence of its delicate structures, and retention of it, until it is developed into a full-grown fœtus. The fibrous tissue of the uterus partakes in the great changes effected by pregnancy. The fibres are developed into well-defined and very large muscular fibres, capable of very efficient action. If we regard the uterus as a single muscle, we can conceive it to be the strongest in the human body. Anatomists have generally followed, without any very material deviation, the description of Madame Boivin. The most interesting additions have recently been made by M. Hélie. Madame Boivin considers the fibres as arranged in two layers or planes, and names them external and internal; but it will be seen by following her description, that while the fibres on the external surfaces differ so much in their direction and grouping as plainly to justify the general idea of two separate and distinct layers, in the central parts there is such intimate interlacing and commingling of them that they cannot thus be divided without cutting extensive fasciculi. The outer layer has an abundant supply of both transverse and longitudinal fibres. A very strong

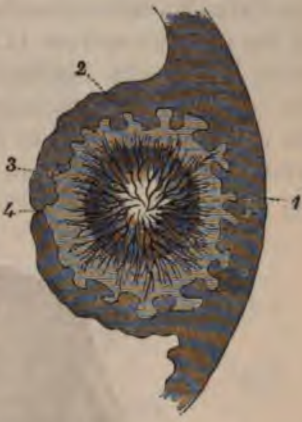


FIG. 53.—REFLEX DECIDUA ENTIRELY CLOSED AROUND THE OVUM.—1. Utero-placental Mucous Membrane. 2. Decidua Reflexa. 3. The Ovum.

longitudinal fasciculus, or band of fibres, extend from the cervix, on the central line of the anterior surface, up to the fundus, where it spreads out into a broad band that covers the whole fundus from one Fallopian tube to another, and then passing down the centre of the posterior surface to the cervix behind. In its course it freely blends with the transverse fibres, which are arranged like the rays of a fan, the large end or base being at the centre, and the small end or apex at the sides. The base of this radiating arrangement extends from one end of the body of the uterus to the other. On the anterior surface one large fasciculus from the lower rays of the transverse fibres joins the longitudinal band, and after continuing its course for a distance spreads out upon the opposite side and is lost within the upper border of the transverse fibres of that side. In the cervix this outside layer is not very thick nor strong, but the fibres for the most part are arranged circularly. On the sides of the uterus the fibres of this layer are transverse, and seem to connect the radiating bands of transverse layers on the anterior and posterior surfaces.

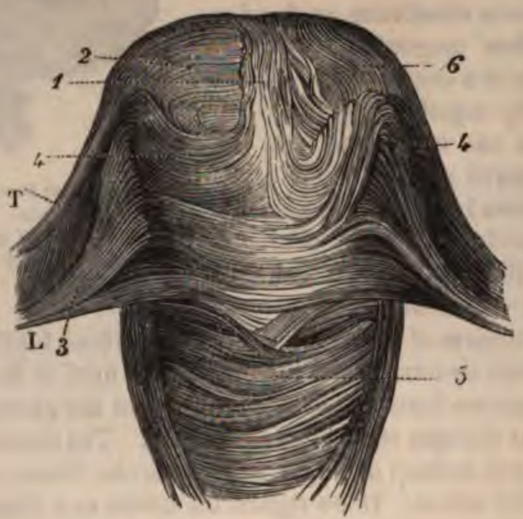


FIG. 54.—ANTERIOR SURFACE OF THE UTERUS. SUPERFICIAL LAYER OF FIBRES.—L. Round Ligament. T. Fallopian Tube. 1. Middle Fasciculus. 2. Transverse Fibres. 3. Fibres of the Round Ligament which expand upon the anterior surface. 4. Fibres coming from the posterior part of the Round Ligament. 5. Cervical Fibres. 6. Transverse.

Their course, although generally transverse, is intricate and confused, and it is difficult to follow them.

The internal layer of fibres is different in its arrangement

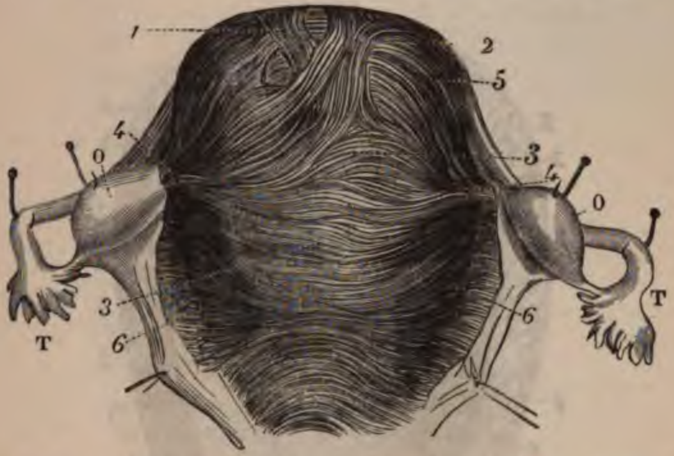


FIG. 55.—SUPERFICIAL LAYER OF THE POSTERIOR WALL OF THE UTERUS AFTER DELIVERY.—O. Ovaries. T. Tubes. 1. Left Branch of the Median Fasicle of Fibres. 2. Right Branch. 3 and 4. Transverse Fibres. 5. Oblique Fibres. 6 and 7. Interlacing of the Fibres of the Anterior and Posterior Walls of the Uterus at the Lateral Borders of the Organ.

from the external. One portion of it is disposed around the opening to the Fallopian tube, on either side, in concentric circles or vortices,—the circles near the tube being very small, while those more remote grow larger as they recede, until the larger touch and intermingle their fibres at the central lines, anterior and posterior walls. On the lower part of the body and cervix the course of the fibres are pretty uniformly circular in their course. On the fundus the general course of the fibres of the central line is longitudinal with reference to the uterine axis. According to Hélie there are on the inner surface of the posterior and anterior walls of the uterus a triangular fasciculus of fibres, the base being upward toward the fundus and the apex toward the cervix; the two upper angles terminating in the opening of the Fallopian tubes on either side. And at the junction between the body and neck the transverse fibres form a projecting ridge which marks the internal os uteri. M. Hélie speaks of the middle layer of fibres situated between the outer and inner layers, in which are situated the vessels of the uterus, the arteries, and veins. It seems to be formed of bands of variable width, and running in every direction—oblique, transverse, and longitudinal. About the vessels it forms rings, loops, and orifices, circularly arranged about the veins and sinuses particularly, so that each vessel traverses true contractile canals, whose calibres and directions are changed by the contraction of the uterus.

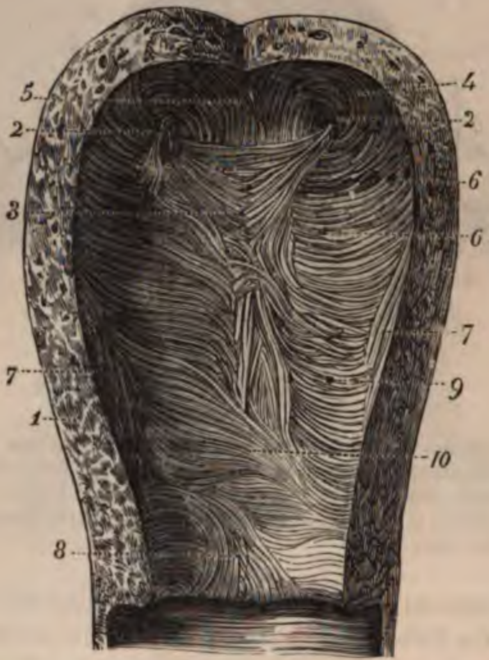


FIG. 56.—INTERNAL SURFACE OF THE UTERUS. SUPERFICIAL LAYER OF THE ANTERIOR WALL.—1. Uterine Parietes. 2—2. Openings to Fallopian Tubes. 3. Triangular Fasciculus. 4. Arciformed Fibre in the Fundus. 5. Interlacing or Arciform Fibres. 6—6. Orifices of Sinuses. 7—7. Portion of the Triangular Fascicules of the Posterior Walls of the Uterus. 8. Fibres of the Cervix. 9. Transverse Fibres. 10. Oblique Fibres.

The vessels in the impregnated uterus are also very much enlarged and hypertrophied as utero-gestation advances toward term.

The calibre of the arteries continues about the same as before pregnancy until they arrive at the place of entrance, where they are very much dilated. After penetrating the external plane of muscular fibres they commence ramifying and dividing up into a great number of branches, which pursue their course along the channels in the middle layer, dividing as they go into smaller branches and terminating in capillaries on the mucous surfaces and in the muscular structure. The capillaries terminate in sinuses grooved through the middle layer of muscular tissues which open into the uterine veins at the surface of the sides between the folds of the broad ligaments. Of course the arteries and sinuses grow to be very large before the end of gestation. Doubtless also the capillaries themselves are greatly developed above their ordinary size, and, we shall have occasion to see, become sinuses at the mucous surface in the placental region.

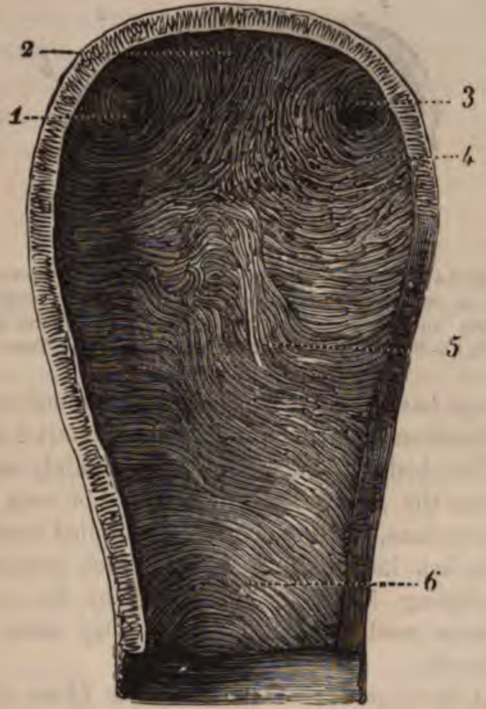


FIG. 57.—DEEP MUSCULAR LAYER OF THE INTERIOR OF THE UTERUS.—1. Vortex of Fibres surrounding the Tubes. 2. Vertical Fibres coming from the Fundus Uteri. 3. Arciform Fibres. 4. Uterine Sinus. 5. Spiral Oblique Fibres. 6. Fibres of the Cervix.

The increasing size of the vessels is necessary to accommodate the increasing amount of blood required to keep up the changes in the uterus, and the nurture of the fœtus. The nerves undergo just as great hypertrophy as the rest of the uterine tissues, being visible in large bands beneath the peritoneal membrane, running in various directions over the anterior and posterior surfaces particularly. The body of the uterus, being mainly supplied with branches from the sympathetic nerves, is not very sensitive to external impressions, while the cervix, supplied mostly with the spinal nerves, has its sensitiveness very much increased by pregnancy. Irritating impressions received by the cervix excite the uterus more readily perhaps than if they were made upon the body directly.

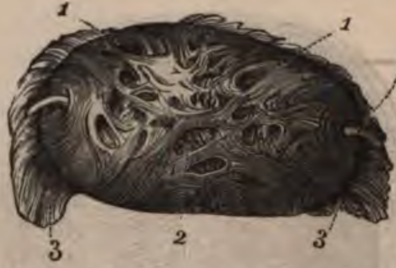


Fig. 58.—Middle Layer of the Uterine Tissue of the Fundus of the Uterus, upon which is implanted the Placenta, showing the interlacing fibres forming Rings around the Vessels.—1. Sinus. 2. Fibres belonging to the Internal Layer. 3. Superficial Layer of Fibres. 4. Fallopian Tube.

The great development of the muscular fibres of the uterus endows that organ with new properties quite essential to the concluding acts of generation. Several other kinds of tissue could be made to contain the fœtus and its appendages, and grow sufficiently to accommodate their growth to fœtal maturity; but none other than muscular fibres could be made the agents of expulsion and conservation so essential after the processes of gestation are completed. Muscular fibres generally possess the normal quality of clonic or intermittent contractility, by which force is exerted, and also a contractility very properly called tonic or elastic contractility, by means of which the shortened condition of the muscle may be maintained after the intermittent contraction has ceased. But in most muscles this last quality is of minor importance, and not very marked. In fact the elasticity of most muscles is slow in being exerted to any great degree. But in the uterine muscles the elastic contractility resides to an enormous extent and in great power. The intermittent or proper muscular contractility is shown, in the phenomenon of labor pains, to contract the calibre of the uterus, and serves to exert a powerful expulsive force; when intermittent contraction ceases the muscles relax, and the uterus has a tendency to recover its former size; but at the time the pain ceases, and muscular contraction gives way to relaxation, this elastic contractility is exerted, and the fibres remain shorter than they were before the pain. Thus one paroxym of pain or intermittent contraction after another occurs, and each time is succeeded by the elastic contraction, silent and without sensation, retaining a part of the progress made until the fœtus is expelled. After it is expelled the capacity of the uterine cavity is lessened to one-fourth of what it was before labor, and retained in that contracted condition by virtue of this elastic contractility. But this is not all. The placenta is next separated by another muscular effort, and the exposed vascular openings pour out blood, which would continue to flow to a disastrous degree but that the continued exertion of this elastic contraction still further diminishes the uterine cavity—"contracts it down"—and in doing so closes the open mouths of the bleeding vessels. The further continuation of this elastic contraction initiates the processes of involution, by which the uterus returns to its unimpregnated volume and density. This account of the alternate and co-operative exertion of these two kinds of contraction, I think, will enable the reader to appreciate the part each plays in this great act. The one contracts and expels, the other preserves the contraction gained. The elastic contraction is essential to the arrest of hemorrhage; without it every woman would die in her first labor. As before stated, the intermittent contractions are attended with pain, and constitute the throes or pains of labor; the elastic contraction is not attended with pain, but is exerted without the patient experiencing any sensation. Although there is a correspondence in the energy of these two kinds of contraction in the same patient, so that the woman who has vigorous and efficient intermittent contractions will be likely to have energetic elastic contraction, and consequently not be in danger of hemorrhage, such is not always the case, for sudden labors are sometimes followed by a very relaxed state of the emptied uterus, and vice versâ. Sometimes this elastic contraction is sufficiently energetic to expel a fœtus without the aid of the intermittent contractions; hence we hear of women being delivered during sleep, or even in the waking state, without having pains, being conscious of the birth of their children only on account of the pressure excited by them upon the soft parts in passing through them.

Contraction occurs spontaneously at term, the elastic first, in such manner as often to completely, and generally partially, dilate the os uteri before the intermittent commences. What is the immediate cause of the establishment of this contraction our science has not yet determined. Contraction may also be awakened and stimulated to increased energy by electricity, by certain drugs, direct irritation of the uterine surfaces, especially those of the cervix; great nervous excitement originating in the emotions, and bodily agitation, may also be followed by the commencement of contraction. It may be controlled, to a limited extent, by anodynes, opium especially; in the earlier months of pregnancy such effect is more marked than near the time for the termination of utero-gestation. Contractility may be impaired by over-distention, by the presence of twins, a superabundance of liquor amni, or sanguineous effusions. Animal poisons, depressing mental emotions, and debilitating causes of any kind may have the same effect. Chronic or acute inflammation of the uterine fibres, veins, or nerves, also impairs the activity of the uterine muscles.

The relations of the uterus to the other organs change very much during pregnancy. At first entirely within the pelvis, with the bladder before and somewhat overlying it; the intestines on and around the fundus, and the ovaries and Fallopian tubes rather above the fundus during the first few weeks. As it increases in size it intrudes into the abdominal cavity, carrying the bladder up with it out of the pelvis, and lifting the ovaria and tubes along with it; they are closely applied to the sides of the organ, and are caused to assume a position several inches below the fundus, while all the intestines are pressed behind it towards the posterior wall of the abdomen. In its extreme ascent it presses the liver, stomach, and spleen against the diaphragm with much force, so as often to embarrass the functions of the former, and, perhaps, the latter also; thus in part accounting for the anæmia which is now regarded as the common condition of pregnancy.

The broad ligaments are greatly developed, being from six to ten inches long; their folds are obliterated, and they are smoothly applied to the sides of the uterus. The round ligaments are also very much increased in length and size, so are the ovaria, and their ligaments are hypertrophied. No less changes are observed in the Fallopian tubes, as all their tissues are increased greatly also.

When the uterus is increased in size, soon after pregnancy is established, it prolapses, and the vagina is shortened; this continues, in an increased degree, up to the fourth month, when the length of the vagina again becomes greater up to the seventh month; at the end of gestation it is again shortened, and on account of the great development of the vaginal portion of the cervix, this tube is very greatly dilated, at the upper portion particularly. The circulation of the vagina is greatly increased, the glands enlarged, and the secretion becomes abundant. From pressure, during the first six months, the erectile tissue about the urethra is strongly injected, and the tumefaction is occasionally so great that it protrudes between the labia. As gestation advances, however, usually the tumefaction is relieved, from the elevation of the uterus removing the pressure.

The enlargement of the uterus also makes pressure upon the vessels and nerves that sometimes gives rise to inconveniences, and even disease, somewhat remote from the pelvis.

It presses upon the vessels passing through the pelvis and along its brim to the parts above. The veins from the lower extremities are often the subject of this pressure to such a degree as to very much retard the current of blood upwards. The blood is accumulated in the capillaries of the parts whence they come, until the serum is pressed out through their parietes and œdema ensues. If the pressure continues for a long time the coats of the veins are distended, large patches of lividity are produced from many small veins becoming large enough to appear through the skin, and the larger along the extent of the extremities become varicose. Some of the trunks of the veins swell out into large sinuses the size of a partridge's and even a pullet's egg, and occasionally burst and effuse some of their contents into the surrounding tissues. The limb becomes painful and clumsy, rendering the patient lame, and causing her to suffer very much. The veins that collect the blood from the perinæum and labia also become enlarged and varicose, in many instances so distended as properly to give rise to apprehensions of rupture and hemorrhage. After gestation terminates in labor these damages are only partially repaired, more or less of them remaining to be reproduced, in an exaggerated degree, at the next recurrence of pregnancy. As the uterus rises out of the pelvis it soon comes in contact with the internal iliac and aortic arteries; they are also the subject of more or less injurious pressure. In some persons, no doubt, the current of blood is decidedly retarded or diminished. This causes the blood to be more plentifully distributed through other large arteries to different parts of the body. Still more influence is exerted in this way as the uterus fills up to the abdominal cavity closely, and presses the smaller arteries in many places—the mesenteric, hepatic, and gastric. All this pressure upon the arteries of the abdomen, preventing so much blood from being distributed by them, causes more of this fluid to be sent through the carotid and vertebral arteries to the brain, inducing unusual repletion of the vessels of the brain, and the consequences not unfrequently noticed in the later months of pregnancy, such as vertigo, headaches, and occasionally apoplexy, and acts as one predisposing cause of puerperal convulsions. But perhaps the most disastrous effects of pressure of the gravid uterus in the abdomen is that exerted upon the vessels of the kidneys. Pathologists are now pretty well agreed that uræmia is one, if not the most efficient, predisposing cause of puerperal convulsions, and that it is brought about by this pressure. The return of blood through the emulgent veins is retarded by this pressure, and distends the capillaries in the cortical tissue of the kidneys, preventing the functional action of those organs; the urea and other excrementitious substances are imperfectly eliminated from the circulation; while the serum, containing albumen, is pressed through the walls of the capillary vessels in the pelvis of these organs, and appears with the urine; this secretion is scanty also, and highly colored. According to Frerichs, the urea is changed into carbonate of ammonia, and circulating through the nervous centres very greatly increases their excitability—predisposing to eclampsia, etc.

The pressure of the uterus on the veins arising about the genital organs gives rise to varices about the labia, urethra, and anus, in the latter locality causing large and troublesome hemorrhoids. Constipation is another result of the pressure of the uterus, partly by obstructing the rectum, but mainly by retarding the circulation in all the abdominal viscera, and diminishing the secretion within them. In many instances the diaphragm is pressed upward, and restricted in its motion very considerably. This also, doubtless, has some effect in deteriorating the blood. It is not surprising, after thus considering the effects of pressure exerted by the gravid uterus upon the digestive organs, and remembering the same effects upon the lacteals and lymphatics which must also be exerted, thus interrupting sanguification, that there is a state of general anæmia connected with pregnancy; that the blood is not as rich in red globules as in ordinary health; there is more salts and water and effete substances in it. M. Cazeau has, I think, pretty well established the fact that there is general anæmia in connection with pregnancy; and now we can easily understand how the local determination caused by pressure upon the arteries, especially the descending aorta, gives rise to local hyperæmia in the upper part of the body, head, and extremities. The ruddy complexion, vertigo, sensation of cerebral tension, and headaches, are caused by this local hyperæmia, thus, doubtless, predisposing to serious difficulties in an advanced stage of pregnancy. The great distention of the abdominal walls does violence to their integrity in some instances. The skin is so stretched that it becomes infiltrated with cicatricial tissue, causing the appearance of extensive cicatrices, which take a long time to disappear, and sometimes they are never effaced, but remain as permanent marks of former pregnancies. The aponeurotic tendons yield also sometimes, permitting the occurrence of hernia in different parts of the abdomen. In some rare instances the muscles are widely separated, and the uterus presses out between, making a kind of uterine hernia. I have a patient who has had two pregnancies; in the first, the interspace between the two recti muscles, near their centre, measured more than twelve inches, and I was under the necessity of devising a strong elastic band, broad enough and firm enough to keep the organ in its proper place.

CHANGES IN THE OVUM.

Soon as the ovum is ejected from the ovisac a series of changes are observed, and they continue during its transit through the tube. The germinal vesicle and germinal spot both disappear, together with the collection of granules at the centre of the ovum. The vitellus, very soon after the ovum is received into the tube, becomes more compact and consistent, and occupies less space, so that the vitelline membrane is not entirely filled by it. The hyaline or transparent fluid of the vitellus, instead of being distributed throughout its substance, is pressed out until it is upon the outer surface, and by the time the ovum has arrived at the uterine extremity of the tube, is collected into a small transparent globule in one place. This globule of transparent fluid is between the vitelline membrane and the surface of the vitellus, and appears to be the place at which, after fecundation, embryonic changes begin to be developed. It is about $\frac{1}{500}$ of an inch in diameter, and is called the polar globule. The above changes occur in ova that are not fecundated.

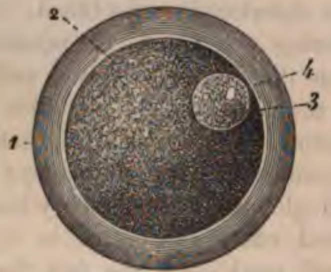


FIG. 59.—HUMAN OVUM.—1. Vitelline Membrane. 2. Vitellus. 3. Germinal Vesicle. 4. Germinal Spot.

When fecundation takes place, the albumen surrounding the ovum, constituting the pellucid zone and the vitelline membrane, becomes thickened. During the passage of the fecundated ovum through the tube the vitellus is undergoing an active metamorphosis.

First a bright transparent spot is seen in the centre of the ovum, which grows by apparently crowding outward the globules. This is called the vitelline nucleus. It seems to be composed of a thick fluid and not to be surrounded by any membranous covering. It soon begins to elongate until its longitudinal diameter becomes double the length of the shorter, and in the middle a girdle or stricture shows itself, gradually growing smaller until it divides the nucleus. While this is going on the vitellus splits in the centre from one side to the other, corresponding with the point of division of the vitelline nucleus.

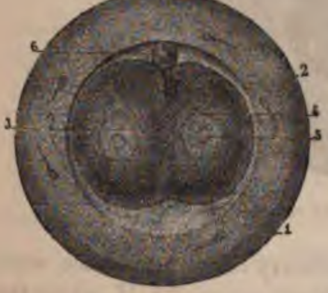


FIG. 60.—SEGMENTATION OF THE VITELLUS.—1. Albuminous Matrix. 2. Vitelline Membrane. 3. Vitellus in process of segmentation. 4. Vitelline Nucleus. 5. Nucleolus. 6. Polar Globule.

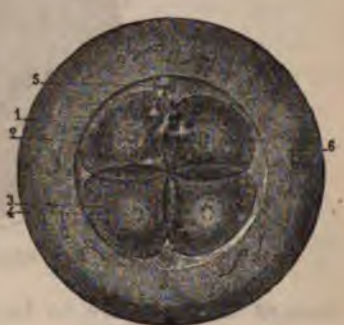


FIG. 61.—SEGMENTATION.—1. Albuminous Matrix. 2. Vitelline membrane. 3 and 4. Vitelline Nuclei and their Nucleoli. 5. Polar Globule. 6. Spermatozoa.

The whole vitellus thus divided assumes two oval-shaped parts, and in each is one-half of the vitelline nucleus, forming a white spot in it. In each one of these halves the same process is repeated until there are four globules. The four, by similar action, are made eight, and so on the subdivision is continued until the whole cavity within the vitelline membrane is filled with a vast number of minute vesicles, or cells, with a portion of the vitelline nucleus in each. This process of division is called segmentation, and while it seems to be set up by the segmentation of the nucleus, is probably due to simultaneous changes in all portions of the ovum. The time required for the ovum to complete its passage through the tube is from twelve to fifteen days, the last half being accomplished more slowly than the first. The granules that enter the tube with the ovum, and surround it, have disappeared, and the ovum itself is quite decidedly increased in size.

The segmentation of the contents of the ovum is thus complete when it arrives at the cavity of the uterus. The cells that are in contact or nearest the investing membrane of the vitellus may be seen, as in the figure, to form a mulberry-like appearance, each little sphere showing its more prominent external half, while the depression between it and its neighbor is also plainly seen. A little later and it will be seen that the row of external cells has adhered together, and the outer wall of each remains, while all

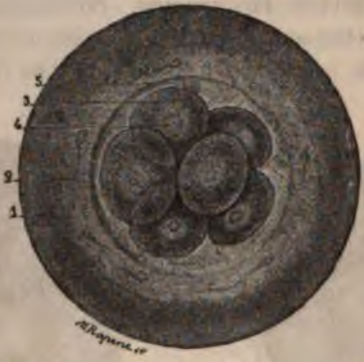


FIG. 62.—More advanced period of segmentation.

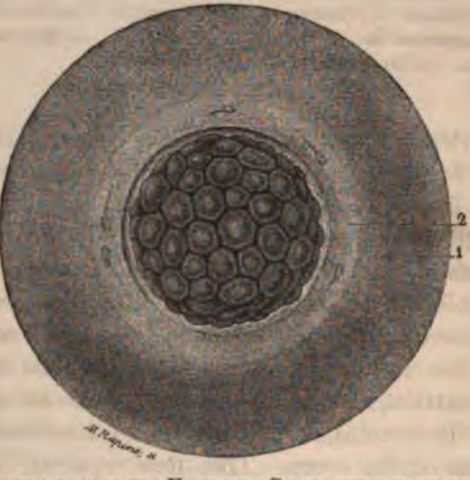


FIG. 63.—CHANGES GOING ON IN THE VITELLINE CELLS WHICH FORM THE BLASTODERM. —1. Albuminous Lamina. 2. Vitelline Membrane.

the other portion has disappeared, and the whole vitellus has become more perfectly transparent.

This change in the external row of cells has formed a membrane to which is attached the name of blastodermic membrane. Now, if the ovum is examined with sufficient magnifying power, we find it composed of, externally, the albuminous layer, zonum pellucidum, thinner than before it left the ovisac, and immediately inside of this the vitelline membrane, thicker than before it left the ovisac, and still within this the newly formed blastodermic membrane, formed of the outer layer of segregated cells, as before explained. The ovum, upon arriving in the uterine cavity, drops into the folds of the turgid mucous membrane, and becomes lodged in the rugæ and there remains. In a very short time, however, it becomes attached to the uterine mucous membrane. At this time a dark spot begins to show itself on one side of the ovum, signalizing the commencement of the formation of the embryo; this is called the embryonic spot. The substance constituting the embryonic spot is situated between the blastodermic and vitelline membranes. As the embryonic spot enlarges, its form becomes elongated, and at each extremity there appears an enlargement, one of which is smaller than the other. The small extremity is called the caudal, while the larger is named the cephalic, which is the position at a later date of the head. In a short time the elongated substance of the embryonic spot becomes incurvated, each extremity forming a projection toward the centre of the ovum. In doing so, the blastodermic membrane is closely applied to the concave, and the vitelline to the convex surface of the embryo; the former contributing, as is believed, to the formation of the mucous surfaces, the intestinal, pulmonary, and urinary membranes, while the latter envelops it externally. Hence the blastodermic is called also the mucous membrane, and the vitelline membrane the serous membrane of the embryo, the former being the internal of the two.

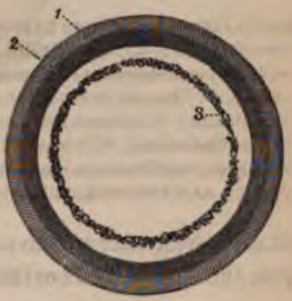


Fig. 64.—Formation of the Blastoderm.—1. Albuminous Matrix. 2. Vitelline Membrane. 3. Blastodermic Membrane formed by the segmentation of the vitelline granules.

As development progresses the cephalic and caudal extremities become more prominent, not only by reason of their increase in size, but also by greater incurvation, making the concavity more obvious upon the abdominal surface, and the dorsal more convex. At the same time the blastodermic membrane at these points is separated more from the outer or vitelline, and forms a prominent fold,

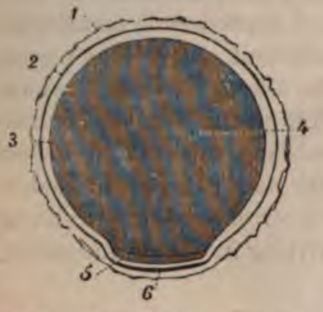


FIG. 65.—DIVISION OF THE BLASTODERM INTO TWO LAMINÆ.—1. The Vitelline Membrane, with the commencement of formation of Villosities. 2. External or Serous Lamina of the Blastoderm. 3. Internal or Mucous Lamina of the Blastoderm. 4. Contents of the Internal Layer, which becomes the Umbilical Vesicle. 5. Area Vasculosa. 6. Embryonal Spot.

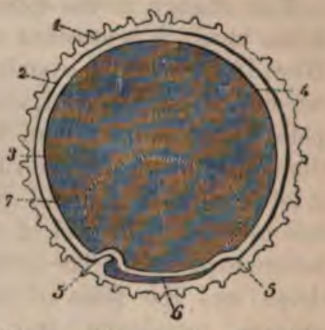


FIG. 66.—FORMATION OF THE AMNION.—1. Vitelline Membrane. 2. External Lamina of the Blastoderm. 3. Internal Lamina of the Blastoderm. 4. Umbilical Vesicle. 6. Embryonic spot. 7. Area Vasculosa.

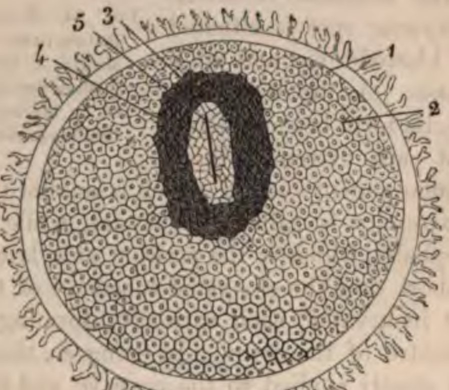


FIG. 67.—FORMATION OF THE EMBRYONAL SPOT.—1. Vitelline Membrane covered with Villosities. 2. Blastoderm. 3. Embryonal Spot. 4. Lucid Area. 5. Primitive Embryonal Line.

doubling back over the two extremities like a hood. This hood-like fold increases at each end of the embryo, folding further back until they approach each other behind the dorsal surface of the embryo and come in contact. They then grow together, and form a shut sac behind the embryo. From this time forward a watery fluid is secreted in this sac in increasing quantities, and the sac grows, the fluid lifting the folds up in the other direction over the facial side of the cephalic extremity and in front of the caudal, or, what would be more correct, the pedal extremity. The blastodermic membrane thus first reflected back forms the amniotic cavity—the shut sac before mentioned—that in consequence of the increasing fluid—the amniotic fluid—finally rises up and fills the whole ovum, enfolding in this development the different organs that go to form the umbilical cord, and closely investing it. As this reflected portion thus rises up the remaining portion of the blastoderm may be seen, forming what is known as the umbilical vesicle, because it is connected with the embryo at the umbilical region, and is compressed into the umbilical cord by the process of development in the amnion, as before described. On the umbilical vesicle may be seen the omphalo-mesenteric vessels—a vein and artery—ramifying in every direction over it. As the constriction of the umbilical vesicle becomes apparent, it will be noticed that it comes up from the concave or abdominal surface of the embryo, nearer the cephalic extremity than the caudal, and that toward the latter a small vesicular protrusion

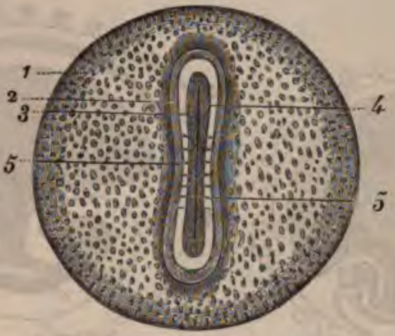


FIG. 68.—VIEW OF THE EMBRYONAL SPOT MORE ADVANCED IN A STATE OF EMBRYONIC DEVELOPMENT.—1. Blastoderm. 2. Germinal Area. 3. Primitive Line. 4. Cephalic Extremity. 5. Ventral Lamina.

is becoming evident. This is the allantois. It grows as the umbilical vesicle is more and more compressed by the amnion until it reaches the vitelline membrane, and spreads out quite largely upon its internal surface. As the allantois rises up, the umbilical arteries and veins may be seen expanding and ramifying upon it, and growing up with it until they, with the allantois, come in contact with the vitelline membrane. When thus in contact, adhesion and consolidation of the allantois and the vitelline membrane occur, while the umbilical vessels spread out into the constantly increasing tufts of capillaries. These capillaries penetrate the vitelline membrane, which has now become changed very greatly, and is called the chorion. The allantois and its vessels in a short time become closely enfolded by the growing amnion, and the umbilical cord is thus complete, containing the remains of the umbilical vesicle and vessels, allantois, and the now fully formed umbilical arteries and veins.

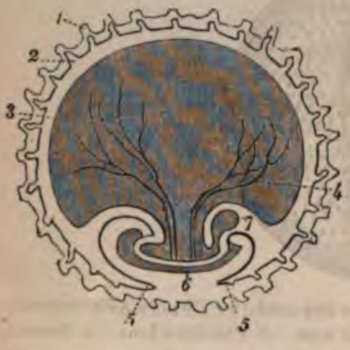


FIG. 69.—DEVELOPMENT OF THE AMNION.—1. Vitelline or Chorion Membrane. 2. External Lamina of the Blastoderm. 3. Internal Lamina of the Blastoderm forming the Umbilical Vesicle. 4. Umbilical Vesicle. 5, 5. Hood-like Projections of the External Lamina of the Blastoderm curving around the Cephalic and Caudal Extremities of incipient Embryo. 6. Embryo. 7. Allantois beginning to show itself.

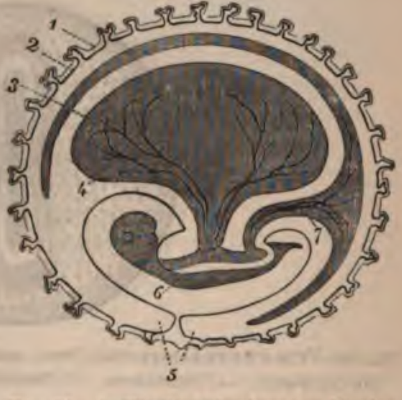


FIG. 70.—1. Vitelline Membrane or Chorion. 2. External Layer of Blastoderm. 3. Internal Layer of Blastoderm containing Umbilical Vesicle. 4. Vessels of the Umbilical Vesicle. 5. Convergence of the Dorsal Hoods for the formation of the Amniotic Membrane. 6. Embryo. 7. Allantois in process of development.

The umbilical vesicle is the remains of the vitellus, and is one of the sources of nutrition during the course of the earlier changes in the ovum. As the embryo is being developed, and requires a greater amount of nutritive material, and it is situated in the side of the ovum, the omphalo-mesenteric vessels are sent out upon the walls of this little sac, and serve as conduits through which the material is brought into the system of the embryonic being. The continually increasing demands, and diminution of internal supply, require the formation of the organs of actual connection between the embryo and the maternal vascular system; and this seems to be the office of the allantois. As it grows, the arteries and vein, which become the permanent umbilical vessels, are carried from the abdominal surface of the embryo entirely across the cavity of the ovum to the opposite side, and spread out over a large part of its internal surface, thus constituting a medium of transit and distribution of this set of important vessels. The amniotic membrane, in throwing its folds behind the embryo, separates it, and lifts away from the vitelline membrane, and by continued development forms the large space filled with water in which the fœtus floats and moves until ready to be expelled from the uterus; and also, by the peculiar manner in which it enfolds the umbilical vesicle and allantoid, compresses them into the round umbilical cord, causing a coalescence of all these parts. It will be seen that the umbilical cord is not contained within the cavity of the amnion, but that it is

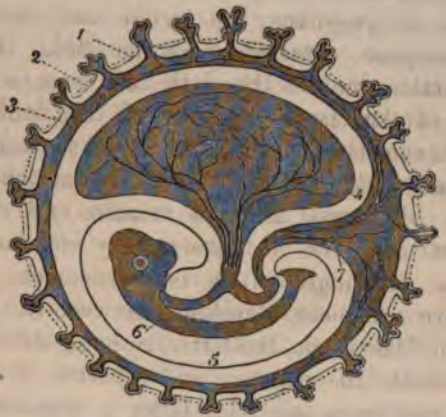


FIG. 71.—The same as Fig. 70, in a more advanced stage of development. At 5 the Dorsal Hoods have united, and the figure is in the Amniotic Cavity.

enfolded in its walls, reflected from the abdomen of the fœtus to the inner surface of the ovum, where it lies on the fœtal surface of the placenta, and cannot be traced into the placental formation. While these changes are going on, the vitelline membrane is also changed, and is transformed into the chorion. In the earlier months of pregnancy the amnion and chorion are separated, the interspace containing a serous fluid. In some cases this space contains fluid to the sixth and even seventh month. The situation of the largest quantity of this fluid is near the cervix, and it is sometimes evacuated without materially affecting the integrity and vitality of the ovum. Toward the latter period this space is obliterated, and the amnion and chorion grow together so intimately as to require very nice management to separate them. Although in the commencement of the formation the embryo was being developed between the vitelline membrane and the blastoderm, the latter, in being developed into the amnion, surrounds the embryo, and separates it entirely from the vitelline membrane, and this latter is transformed into the chorion.

During the time the changes in the vitellus are going on, whereby the amnion and umbilical cord are formed, as before stated, the vitelline membrane is greatly changed also. On its external surface it becomes first roughened, and afterward there sprout out villous projections so numerous as to stand in contact, and when fully formed, at the end of three weeks, instead of being a round smooth body, the ovum, when placed in water, is about eight lines in diameter, and covered all over with these floating branches, that wave loosely as the fluid is agitated, not unlike tentacula. Each one of these numerous projections is a conical tube, the base, or large extremity, planted into the membrane (chorion), and the smaller floating free. The calibre of the tube is larger at the attached end, and a mere microscopic opening at the free extremity. These villi, probably, are the medium of transit for nutritious substances from the mother, and effete material from the ovum, and in this way they serve something the office of the placenta. If it is remembered that these projections grow from its surface, while the ovum is embraced in the duplicature of the hypertrophied mucous membrane of the uterus, it will be easily understood how they insert themselves into every depression with which they are in contact. Very many of them grow into the mucous follicles of the mucous membrane of the uterus, penetrating the whole thickness of that membrane, while others insert themselves into any and every minute fissure and pit of the uterine surface. This view of the subject shows how intimate the connection between the surfaces of the ovum and uterus becomes. By the time the villous projections are complete the allantois is in contact with the inner surface of the chorion throughout a large part of its extent, bearing in its lamina the umbilical arteries and vein. So soon as these vessels touch the chorion, they send out capillary extensions through this membrane to the extremity of the villi upon it surface. Large numbers of these villi contain the capillaries of the embryonic vessels. They are thus filled up with them, continue to grow and expand, allowing the capillaries within them to become increased in number so as to form tufts of minute vessels, that extend in their cavities where they are contained within the expanded tubes of the mucous follicles

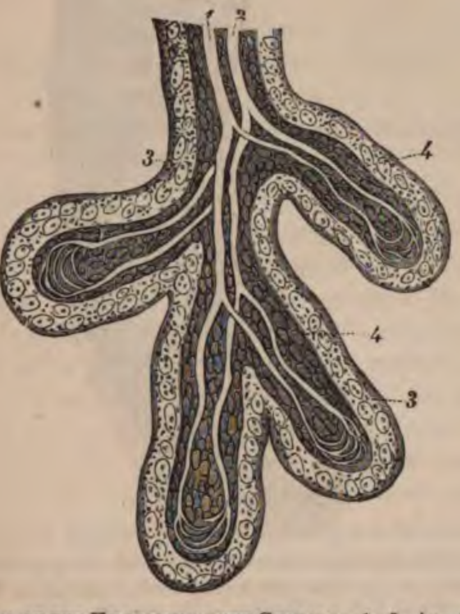


FIG. 72.—PORTION OF THE VILLOSITY OF THE CHORION.—1—2. Anastomosing Vessels of the Villosity. 3. Chorial Tissue that forms the Villous Wall. 4. Laminous Tissue that isolates the Vessels.

of the uterus. The reader will recollect that the uterine follicles all contain capillaries of the veins and arteries of the uterus, and that in the villi the capillaries of the fœtus are placed alongside of them. As the capillaries from each part become larger

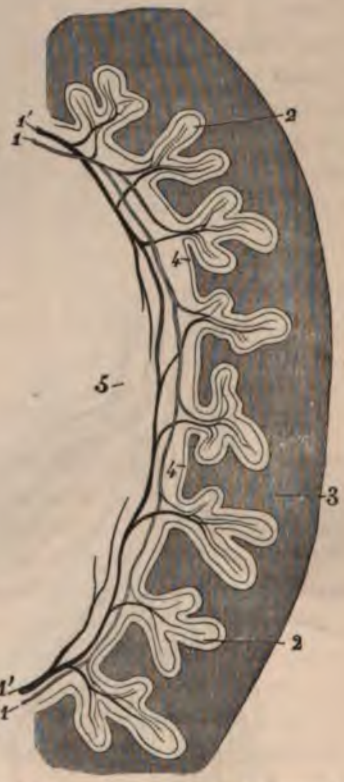


FIG. 73.—APPEARANCE OF THE VILLOSITIES OF THE CHORION AT THE COMMENCEMENT OF THE ALLANTOID CIRCULATION.—1. Trunk of the Allantoid Artery. 1'. Trunk of the Allantoid Vein. 2. Villosities supplied with Capillaries. 3. Uterine Mucous Membrane penetrated by the Villosities of the Chorion. 4. Chorion. 5. Cavity of the Ovum.

they are present in close contact, and all the intervening tissues are removed, and nothing but the delicate lining of the two remain, held together by a very small amount of extremely attenuated connective tissue. Now in this arrangement the mother's blood, circulating through its own capillary vessels, is separated from that of the child only by the very delicate walls of the two systems of capillaries. This is the commencement of the formation of the placenta. The vessels are intertwined with each other. If we follow the further development of the vessels of the two systems of circulation we may understand the appearances in the placenta without much difficulty. The original number and distribution of the uterine capillaries remain the same from the beginning of the formation of the placenta, in the early weeks of embryonic formation, and its maturity at full term, but the size of them is increased from microscopic calibre to large sinuses, or sacs, that are included in the substance of the placenta, for the veins, while for the arterial capillaries we have the curling arteries of the older writers. Hence the anatomical peculiarity of comparatively large arteries emptying directly into veins or venous sinuses of great size. On the other hand, the capillaries of the fœtus remain minute in size, but increase vastly in number. This great increase in the number of the capillaries of the fœtus, which, as they grow, push and press into the bulk of the maternal sinuses until they make a thick spongy mass, gives the appearance of the placenta being almost wholly of fœtal origin. Upon examining the fœtal capillaries and small arteries that enter the placenta from the fœtus, they may be seen to arrange themselves into lobules, and between these are the chasms or cracks formed by the venous sinuses of the mother, which, as before stated, were formerly capillaries on the follicles of the mucous membrane of the uterus. In the empty and collapsed placenta these sinuses are collapsed and

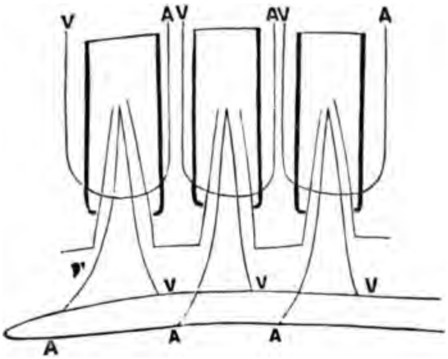


FIG. 74.—This Figure shows how the Villosities of the Ovum penetrate the Mucous Follicles of the Uterus.—A Arterial, and V the Venous Capillaries.

empty; but in the attached placenta, while the blood is circulating through it, they are doubtless distended and full. These interlobular sinuses may be traced in some places to the amniotic membrane on the fœtal surface of the placenta, penetrating the whole of this organ. On the maternal surface of the placenta the lobules of the placenta, between the penetrating sinuses where they abut against the uterine tissue, apparently denuded of the mucous membrane, present a peculiar raw appearance, and indeed they are not covered by any membrane except such as enter into their own structure. They are also brought in close proximity to the blood circulating in the uterine capillaries within the muscular structure of the uterus. There are also many large veins in the uterine tissue with which they are in contact. At the commencement of this commingling of the capillaries between the chorion and the mucous membrane of the uterus, almost the whole circumference of the ovum was penetrated by the capillaries of the umbilical vein and arteries; but as the ovum grows, and the embryo is being developed, the side most remote from the uterine wall loses its villous roughness and becomes smooth, until at the end of the second month, or during the third month, the smooth side of the ovum is largest, and in the fourth month nearly one-half of the inside of the uterine walls is occupied by the placental attachment, and more than one-half of the ovum is smooth, and formed of the distended membranes. Thus the placenta is slowly isolated, and may be considered sufficiently formed to be called placenta in the third month. It becomes more dense and compact all the time up to term, occupying each month less space, comparatively, of the uterine surface than the former one and becoming thicker through from one surface to the other. I think the observation is just also, that the relative quantity of blood circulating through the extreme capillaries of the fœtus, compared to the size of it, is gradually becoming less from the time the allantois is complete up to full term; and also that the ratio of increase in the growth of the fœtus each day becomes less.

The Membranes.—The deciduous membrane is a maternal product, and its function seems to be a medium of communication between the mother and fœtus. It first entangles within its folds, as the turgid mucous membrane of the uterus, the ovule, embracing and retaining it in position, furnishing fluid to be endosmosed by the ovum in its early growth, and when the vessels of the fœtus reach the chorion it receives their penetrating ramuscles within its large follicles, and continues to grow with the growth of the vessels, intimately entering into the structure of the placenta. All around the uterus, remote from the placenta, it assumes a thin translucent membranous form, enveloping the ovum and applying itself close to the chorion throughout its whole circumference from the edge of the placenta. The chorion is inside of the decidua, and, as before stated, closely applied to it is one of the membranes of the ovum. At the placenta, and within its substance, the chorion is inextricably blended with the decidua. It also penetrates the placenta throughout. It accompanies and envelops the fœtal capillaries, arteries, and veins. From the placenta, extending around and filling the whole uterine cavity, it is also a thin translucent membrane, and reduced, like the decidua, by the processes of atrophy and distention to great simplicity of formation.

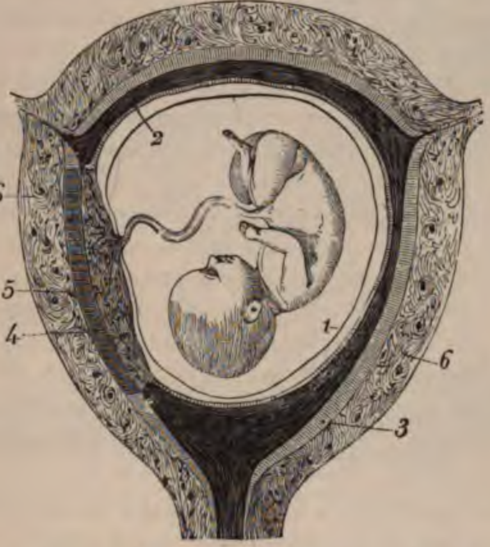


FIG. 75.—CONNECTION OF THE OVUM WITH THE CHORION AT THE THIRD MONTH.—1. Amniotic Membrane. 2. Reflex Decidua. 3. Decidua Vera. 4. Utero-placental Membrane. 5. Placenta. 6. Muscular Tissue of the Uterus.

The amnion is also a fœtal membrane. It is inside the chorion, and closely applied to it, and is also a simple membrane, translucent and polished in appearance. It is reflected on the cord so as to completely enfold it, and is the efficient medium of connection between all the parts that enter into the composition of the cord. It covers the fœtal surface of the placenta, and the vessels of that organ may be distinctly seen ramifying beneath it. It does not send prolongations, nor in any way enter into the composition of the substance of the placenta, but is simply applied to its fœtal surface, adding thus to the firmness of its structure and giving it the highly polished appearance this surface bears. These membranes constitute the membranous bag in which the fœtus grows and is developed,—the decidua externally, the chorion next, and the amnion internally situated. Within this membranous bag, in addition to the fœtus, is the liquor amni. It is almost wholly water in its composition. In one hundred parts there are ninety-eight per cent. of water; the remaining two per cent. are salts of soda and lime. In the early months it is quite clear and transparent, but often becomes turbid, sometimes milky in color; at other times it contains dark flocculi or yellowish particles. Compared to the size and weight of the fœtus it is very abundant in the early months, being equal in weight with the fœtus about the middle of utero-gestation, while at the end of pregnancy it would ordinarily weigh about one-third as much as the fœtus. Occasionally it remains abundant, at other times it has almost entirely disappeared at the end of nine months. It separates the walls of the uterus so widely, and is so abundant up to the fifth month, that the fœtus moves with great facility in any direction, and permits of change of position without scarcely touching the uterine walls. The scarcity of it at term allows the uterine walls to embrace the parts of the fœtus somewhat closely, and thus renders the change of position more difficult and less frequent. It is probably simply a transudation from the vessels of the amnion; or it may be transuded from the walls of the uterus through all three of these membranes. The amniotic cavity is doubtless the receptacle of the excretions from the fœtus in the last weeks of pregnancy, and there is not much doubt but that it is also swallowed in some quantities by the fœtus, but there is but little if any reason to believe that it is a source of nutriment for the fœtus.

The *placenta* is outside the amniotic cavity, is formed in the hypertrophied chorion and decidua, is inside the cavity of the decidua, and forms a part of the cavity of the chorion. The amnion covers continuously the fœtal surface, while the decidua vera becomes the utero-placental membrane, and sends prolongation into its substance. It consists of the fœtal and maternal vessels intertwined and lapped upon each other. A very fragile vascular mass, it is easily ruptured by violence, and gives way under slight pressure of the finger, being only sufficiently more firm than a blood clot to be distinguished by the touch from it. The diameter of the placenta is from seven to eight and a half inches generally, nearly circular, three-quarters of an inch thick in the centre, and becomes very gradually thinner toward the circumference, until at the edge it is less than a quarter of an inch. This is the normal placenta, but many deviations in shape, size, and thickness are seen. It is elongated sometimes; again, instead of being single, it is sometimes divided into two parts with vascular connection. The funis is implanted upon the centre of the placenta ordinarily, yet in very rare instances it is nearer the edge in one direction than another, and cases are on record where the cord was attached to the edge, when the placenta presented an elongated shape. There are two surfaces, one fœtal and the other maternal. The fœtal surface is turned toward the cavity of the ovum, and is covered with the amniotic membrane, which gives it a highly polished appearance. Beneath

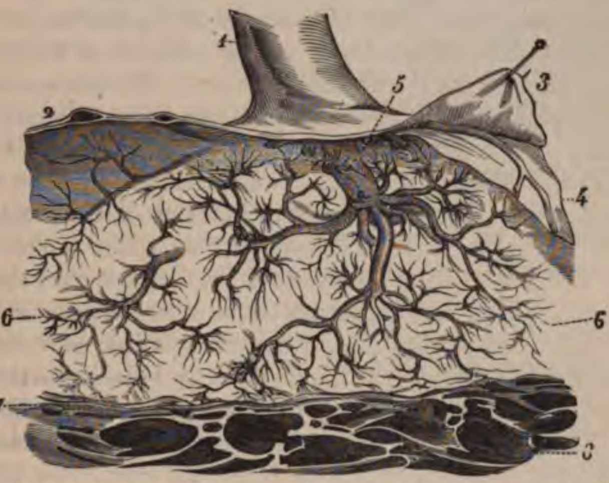


FIG. 76.—TERMINATION OF THE UMBILICAL VESSELS IN THE PLACENTA.—1. The Cord. 2. Laminous Membrane. 3. Superficial Layer. 4. Deep Layers. 5. Great Trunk terminating in Dividing Vessels. 6. Tuft produced by the termination of smaller vessels. 7. Utero-placental Mucous Membrane.

this smooth covering the veins and arteries send their ramifications in every direction, giving the appearance of cords,—the veins being especially prominent and large, and showing their blood through their walls. The ramifications of the vessels run toward the circumference of the placenta, like radii from the centre. The vessels of the cord do not branch or divide until they arrive at the surface of the placenta. The maternal surface looks very different from the fœtal. If examined soon after expulsion, on this surface there will be found a number of small clots of blood. It is rough, and presents a granular appearance, and is divided by furrows or deep sulci into lobes of irregular shape and various sizes. The vessels of the mother and fœtus do not inosculate in any way, so that the blood of one cannot pass into the vessels of the other; but the walls that divide them are so thin that inter-osmosis is free between them. The serum of the blood, with its solutions, thus permeates the capillaries of the two, finding its way from one to the other quite freely.

The cord, or funis, is the medium of circulation between the fœtal body and the placenta. It is not far from three feet long upon an average; but there are great extremes in this respect. Very rarely it is so short that the placenta and the abdomen of the fœtus are in contact; sometimes it is only a few inches longer; in a few cases it is very long, four to six feet. It is generally about half an inch in diameter, sometimes an inch, at others not more than a quarter of an inch. Varicosities or nodulations are often found upon it, and occasionally it is tied in knots. The vein pursues a direct course in the centre of its substance, while the arteries run spirally around this vessel from one end to the other, giving the cord the appearance of being twisted, much more frequently from left to right. The cord contains the umbilical vein, the umbilical arteries—two in number—the remains of the umbilical and allantois vesicles, atrophied so as to be recognized only by means of very skilful dissections, and a peculiar gelatinous substance. It is kept together by being enfolded into the amniotic membrane, which latter makes for it quite a firm investment. There is also in it some very frail connective tissue. There are probably no nerves or lymphatics in the cord. It is single, uniform in size and shape from the umbilicus to the centre of the placenta. Some very rare exceptions may be found on record where it has divided several inches from the placenta.

The functions of the placenta are, I think, pretty well determined. It is the medium through which is transmitted from the mother the pabulum of nutrition to the fœtus. Whether it causes any changes in the qualities of the nutrition thus transmitted is not ascertained, nor is it known whether the nutrition arrives into the system of the fœtus ready to be used for the purposes of nutrition, or that further hæmatosis is required to effect it after it is received by the fœtus. Oxygen must also get transmission in the same manner, carried by the vessels of the mother to the placenta, and from this organ, by the umbilical vessels, to the fœtus. In what combination oxygen is transmitted, we are not, so far as I know, definitely informed; but it is well understood that in it the blood undergoes the change from what is called venous into arterial blood,—the dark or venous blood occupying the umbilical arteries, while the umbilical vein is filled with blood in an oxygenated state. The effete material produced by the growth and changes in the fœtal organization is doubtless removed from the blood of the fœtus through the agency of the placenta, and given over to the maternal blood, whence it finds its way out through her excretions. As there is no exchange of blood-globules between mother and child, the oxygen, as well as the nutritious substance intended for the growth and production of the fœtal organs, must be contained in appropriate combinations in the serum of the blood of the mother, ready for appropriation by the fœtal organism to its own uses. I think the explanation of the mode of transmission is found in the laws of endosmosis and exŏsmosis. The blood of mother and child meets in the placenta, separated only by the thin walls of the two systems of capillaries, where, being of different composition in each set of vessels, a mutual interchange of the more attenuated portions of the blood takes place,—the one containing the effete material of the fœtal organism, the other the products of perfect hæmatosis in the maternal organs, traversing the capillary membranes in different directions at the same time. I do not believe that in the latter weeks of fœtal existence the liquor amnii is the source of nutrition, either by deglutition or by absorption; but I think there is no question but it becomes the recipient of some of the fœtal excretions, the urine and fæces, and perhaps the cutaneous excretions.

In multiple pregnancy the placentæ are entirely separate in organization, there being no communication with more than one placenta by any one of the fœti, nor any interchange of blood-vessels between the placentæ themselves; but the placentæ are usually in close proximity, their edges being in contact, and their shape modified, so that indeed, without close anatomical investigation, they might easily be regarded as one placenta. Each

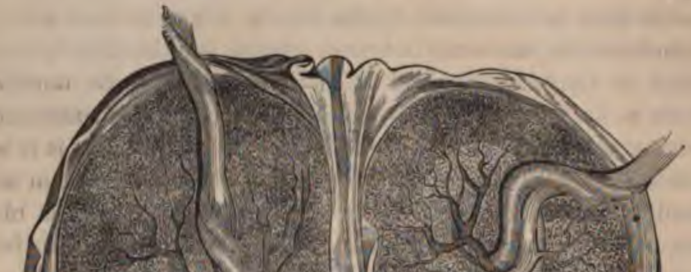


FIG. 77.

fœtus is invested also in separate amnii and chorions, but included in one continuous decidua; and occasionally the two are included in one chorion. Each fœtus is also supplied with a separate cord.

Development of the Fœtus.—The modes of growth and development vary with the periods of gestation. Until the ovum arrives in the uterus, and even for a short time after, the growth is apparently simple cell development. The fluids contained in its cavity undergo visible changes, the granules, germinal vesicle, and germinal spot disappear, and give place to differently formed bodies, and the ovum increases somewhat in size by imbibing the fluids by which it is surrounded. As the embryo begins to appear, vessels are formed emanating from a central point and spreading upon the umbilical vesicle—the omphalo-mesenteric artery and vein. The object of these vessels seems to be to place the embryo in communication with the whole walls of the ovum, by ramifying over them and absorbing its contents. During the time these vessels are performing their office of absorbing and carrying nutrition to the embryo, the ovum is surrounded by the liquids in the uterus, and endosmosis is active taking up this substance and appropriating it. Still later, the internal supply of nutrition contained in the original vitellus is exhausted, and a supply from without is rendered by the vascular connection between the fœtus and mother; first, in the diffuse ramifications of the fœtal vessels through the chorion from the allantois, and finally, in the more compact formation of the placenta. Before the formation of the placenta the incipient child is called the embryo; after the placenta is perfected it takes the name of fœtus. It is beyond the scope of this work to trace with more

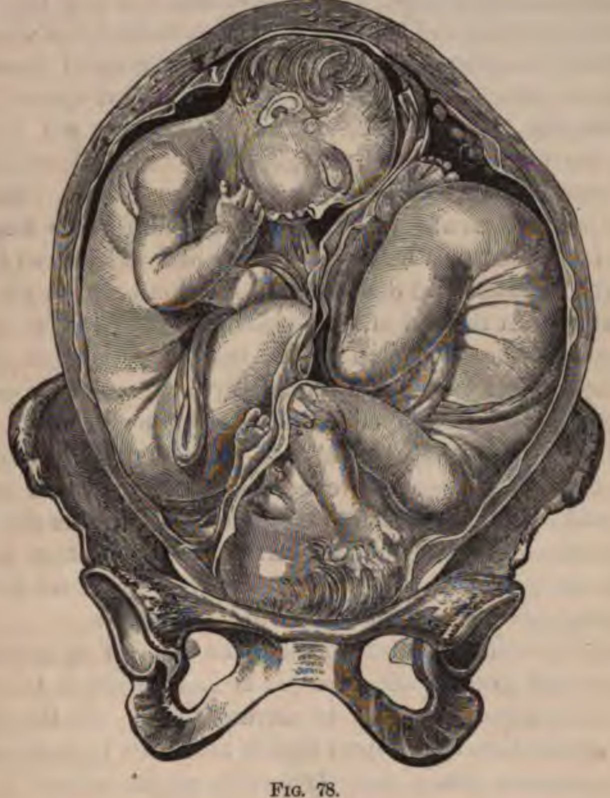


FIG. 78.

minuteness the progress of development of the organs of the embryo, and would not contribute anything of importance to practical obstetrics. At the end of two months the head is large, the eyes may be distinguished, the extremities have become of some considerable length, and the genital organs are perceptible. The embryo, at this time, is from one and a half to two inches long, and, according to Cazeau, weighs from three to five drachms; the cord is complete, and the placenta in progress of formation, though not complete. Its structure is loose, and spread over a comparatively large surface, and if the ovum is not expelled whole, has not consistence enough to be removed entire, but comes away in shreds. At the expiration of ten weeks the embryo is from one and a half to two and a half inches long, and weighs from one and a half to two and a half ounces, and there is increasing firmness and density of connection between the ovum and uterus. At the end of the third month the embryo is from four to six inches long, and weighs from three to four ounces. The placenta has now become tolerably firm, comparatively less in extent, and is still expelled entire with some difficulty. The villi of the chorion are pretty well gone, and the membranes remote from the placenta have become transparent and smooth. At the end of the fourth month the embryo has become the fœtus, the internal organs are assuming perfection of structure, and the placenta is complete in organization. It is from six to eight inches long, and weighs from seven to eight ounces.

When the fifth month is completed the vigor of its movements indicates still greater advance. It is from eight to ten inches long, and weighs from eight to eleven ounces. At the end of seven months the liquor amnii is very much less proportionately, the fœtus more nearly fills the cavity of the uterus, and its organization has been perfected to such a degree as to render it capable of independent existence in case it should be expelled from the uterus. It is from twelve to fourteen inches long, and weighs from one and a half to four pounds. At the end of nine months all the fœtal organs are perfect; the lungs, the ductus arteriosus, ductus venosus, and heart, as well as such organs as do not undergo any change at birth. The skin of the fœtus is covered with a thick unctuous coating, especially abundant in the axilla, on the back, in the flexures of the limbs, and about the head. This covering seems to be a secretion from the cutaneous glands.

It commences to make its appearance about the middle of the term of pregnancy, is thicker during the fifth and sixth months, and has commenced disappearing before the child is expelled, and, indeed, in some instances is nearly gone at birth. During the early months the liquor amnii is quite abundant, compared to the size of the fœtus, weighing several times more in quantity during the second and third months. The relative proportions of the two approach each other until about the middle of the term, when the weight is nearly equal. At the end of pregnancy the weight of the fœtus is more than double that of the fluid.

Anatomical Peculiarities of the Fœtus.—The capillary system of blood-vessels is very abundant, and their superficial area exceeds that of the large vessels greatly more than it does afterwards. From the commencement of intra-uterine development there is constant increase in the deposition of solid substances. The ovum is formed of fluids, and as time and development go on the solids appear continually, become more firm and greater in quantity until at the end of gestation, when the solids preponderate greatly in quantity. Indeed, if we trace the progress of human development through life in its various phases, we find that one of the most obvious facts is the change that takes place in relation to the proportionate amount between the fluids and solids of the body. From the time of conception, the older we grow, the drier and more dense our system becomes. The old man has but little fluid in his system, his bones are more earthy, compact, and brittle, his blood-vessels, muscles, and tendons are prone to ossification, and his secretions and excretions are less abundant and more solid than formerly. The youth, compared to the fœtus, is as much more solid, and possesses as much less fluids, proportionately, as the senile compared to him. The skin of the fœtus, when expelled, is rosy red and very vascular; it feels soft and moist, the adipose substance is abundant, the muscles are very soft, the bones elastic, so that they will permit of being bent. The great sympathetic system of nerves are more perfectly formed, and perform their function more completely than any other parts of the nervous system, so that nutrition is more active than sensation or motion.

The brain is soft, almost diffluent, and none of the nerves of sensation nor the organs are perfectly formed. The nose, the eye, the ear, the tongue—especially the gustatory development of the nerves of it—are all imperfect. The blood is less highly oxygenized, and the white portion of the blood is much more abundant than the red, and more solid. The main anatomical difference between the fœtus and the child consists in the vascular system. The internal iliac arteries in the fœtus give off a branch each that is continued up the inside of the abdominal muscles—between them and the peritoneal membrane—to the umbilical opening, where they pass out and become the umbilical arteries. These two branches are closed up in the child, and become mere cord-like elevations at those places, converging at the umbilicus. After the umbilical vein enters the abdomen it passes the fissure on the under surface of the liver, and after proceeding some distance in that fissure sends off two large branches to the liver, and then goes on to become the ductus venosus, which enters the ascending vena cava. This venous duct is also closed very soon after the blood from the placenta ceases to flow through it, and is soon transformed into a solid cord. The two auricles of the heart communicate with each other through an opening in their septum called the foramen ovale. This opening is closed, as a general rule, during the first month after birth; but in rare instances it remains open for a much longer time. From the main trunk of the pulmonary arteries, before it divides into the right and left, an arterial tube extends to the concavity of the arch of the aorta, which it enters. This is named the ductus arteriosus, and is collapsed and becomes solid in early infancy. These anatomical differences cause quite a difference in the course and distribution of the circulation of the blood. From the placenta the blood enters the vein leading to the liver; a large part is distributed to that organ. The remainder enters the ascending vena cava through the ductus venosus, and passing upward with the portion coming up that vessel from the lower extremities, enters the right auricle. From this auricle the blood enters the left through the foramen ovale, whence it enters the left ventricle. It is injected by the contraction of this cavity into the aorta, to be distributed largely to the brain and upper extremities. It must be borne in mind also, that through the hepatic veins proper the blood from the liver passes into the current upward in the ascending vena cava. To look more considerately at this current of blood, we find it made up of the venous blood from the lower extremities, all the abdominal and pelvic organs, and that coming from the placenta. The blood coming from the extremities and viscera, having traversed the arteries and capillaries, is much deteriorated by the reception of effete material and the loss of oxygen, and would be poorly calculated to contribute to the vital changes in the brain and upper extremities did it not derive oxygen and new nutritious substance from the placental blood. This last changes the color and composition of the whole, and makes it resemble the arterial blood of the child more nearly in the ascending vena cava than in any other part of the circulatory circle. The blood coming from the head and upper extremities enters the right auricle through the descending vena cava, and passes almost wholly into the right ventricle. From this it is thrown into the ductus arteriosus, and thus finds its way into the arch of the aorta below all the branches to the head and arms, and is circulated to the abdominal and pelvic viscera and to the lower extremities. As it passes downward about half of it is sent by way of the umbilical arteries to the placenta. These are the main peculiarities of the fœtal circulation. One other is, that there is but very little blood sent into the lungs through the pulmonary arteries, and the air-cells are collapsed, and the lungs occupy much smaller space than after birth. In fact it is the dilatation of the air-cells of the lungs that initiates all the changes in the direction of the circulation of the blood, by rendering the anatomical differences in the vascular system unnecessary, and causes them to disappear. Thus the dilatation of the pulmonary cells also expands the minute branches of the bronchi and capillaries between the pulmonary arteries and veins, and creates a vacuum through which the blood rushes from the right ventricle, immediately diminishing the current in the ductus arteriosus, and pouring a torrent of blood through the left auricle into the left ventricle, and thence into the aorta. The blood thus copiously supplied with oxygen is attracted into all the capillaries. I think that this sudden supply of oxygenated blood, filling the small vessels with sufficient of oxygenated blood to keep up active nutritive changes, does away with the molecular attraction that draws the blood from the placenta through the umbilical vein. In this way the breathing of the child sets on foot the changes that turn the fœtus into an infant. The parts most liberally supplied with placental blood grow more rapidly than other portions of the fœtal system. The liver is proportionately much larger than in the adult. The head, shoulders, and arms are also proportionately larger than the pelvic extremities of the fœtus. So soon, however, as all the blood is equally oxygenated, by the lungs assuming their functions, and nutrition abundantly supplied and equally distributed, equilibrium of growth is established, and all the organs gradually arrive at the proportions in dimension and weight which they afterwards maintain.

SYMPTOMS OF PREGNANCY.

The first symptom that generally creates suspicion in the mind of a woman is the suppression of the menses. Most women regard it as a pretty certain sign of conception when all the circumstances exist that render them liable to pregnancy, and when the person is in good general health they are generally right. But occasionally we meet with instances, especially in the newly married, where the menses do not make their appearance for several months, without the existence of pregnancy, and the person enjoying the best of health. More frequently, however, there are evidences of undue excitement or disease somewhere. When such is not the case it is only an exception, and but a rare one, to the general rule. Some women are irregular, and the non-appearance of the menstrual discharge for several months does not indicate pregnancy; but then their history will enable us to learn the fact of irregularity. These irregularities are very different in different instances. In some the postponement is one or two weeks, with some regularity; while in others, sometimes they will pass over the time one week, and then four or six weeks, or three months. I know one woman who cannot predict the return of her menses by several months, it being sometimes one year or more between the time of return; and when they do return her liability to pregnancy is so great as to generally date the beginning in each instance. In other instances pregnancy occurs in persons who do not menstruate, in consequence of nursing. On the other hand, menstruation continues to occur for a part or the whole term of pregnancy, occurring once, twice, or three times in the first part of pregnancy, or, as before remarked, continues to occur each month. These are all *exceptions* to the rule, and can be of only exceptional value as a sign. If the woman is healthy, and has been for some time past, and has always been regular as to time, we can scarcely admit the sudden cessation of the menstrual discharge from any other cause than pregnancy or the change of life, so that in such cases the sign is quite valuable.

The next most common symptom is derangement of the stomach. Soon after the time for the appearance of the menses has passed the patient feels nausea, which may be very slight, or amount to severe and very protracted vomiting. Not only the degree but other circumstances connected with the nausea vary greatly; the time of the day when it occurs is not the same. The most common time is immediately upon rising in the morning. The patient feels quite comfortable until she gets up, and perhaps begins to dress, when nausea, and often vomiting, occur, which in the course of half an hour passes away, and she experiences but little if any inconvenience until next morning. With others the morning sickness is more protracted, preventing the enjoyment of breakfast, but permitting a good appetite and the digestion of the other meals of the day; or after having left the person in the morning, allowing the breakfast to be partaken of, a part or the whole is rejected without digestion having commenced, dinner and supper being retained and digested well. All the meals may be eaten with a good appetite and a large part thrown up, or the vomiting may be continued so as to disable the woman from retaining or digesting her food sufficiently to keep up a good state of nutrition, and in extreme cases causing her death from inanition. But not unfrequently the sickness does not take place in the morning, but occurs at other times in the twenty-four hours—the middle of the day, in the evening, or even at night after retiring, preventing sleep during ordinary hours. What is the cause of this nausea? Pregnancy, of course; but how? It is believed by many men of enlarged experience that it does not occur in persons who are entirely healthy, and that by properly seeking for it we will find some pathological condition that will sufficiently explain it.

Some believe that the uterus is more or less inflamed, especially the cervix, and that the morbid condition of the uterus gives it greater sympathetic influence over the stomach; or that the liver is torpid, or otherwise deranged in some manner as the effect of pregnancy; or that the stomach is congested on account of the condition of the liver; or that the stomach is hyperæmic independently; or, again, that there is a general torpor of the whole alimentary canal, causing constipation, indigestion, and vomiting. These gentlemen base their treatment of it upon their theoretical views of the state of the organ. Dr. Grenhalgh, of St. Bartholomew Hospital, London, uses suppositories in the vagina of morphia in cocoa butter, because he thinks irritation or inflammation of the uterus is the cause of the vomiting. He introduces, as often as necessary, a half-grain of sul. morph. mixed with cocoa butter, and reports much benefit from its use. Believing that there is hepatic congestion, some physicians give a brisk cathartic of calomel, and occasionally, doubtless, with great benefit. Others blister the epigastrium to remove the gastric hyperæmia, and if this is not sufficient to answer their purpose, remove the cuticle and sprinkle the surface with morphia. Some, again, give antacids to relieve the acid state of the stomach, or small alterative doses of mercury, taraxacum, etc., to relieve the hepatic congestion. Lime-water, soda, liquor potassæ, etc., will, some one of them, answer this indication. Remedies whose action is not understood, and that are said to be good for this kind of vomiting, as oxalate of cerium, in five or six grain doses every few hours, bismuth, etc., are often used with great advantage. With some practitioners there is believed to be some indefinable condition of the nervous centres, not unlike sea-sickness, that requires nerve stimulants, as brandy, ammonia, strong coffee, and other such remedies; and these too have sometimes a very happy effect. We do not know the essential condition giving origin to this many times distressing symptom. All we know is that it is one of the sympathetic effects of the uterus in pregnancy. We certainly often meet with persons who suffer very severely that have faultless health at other times, and an examination of whom fails to find any of the pathological states to which it is attributed. This last year I had a patient of this kind; no sign of disease elsewhere existed so far as I could find. After I had exhausted the list of remedies in my possession, her husband apparently cured her with hot whiskey toddy. Yet when she was well she did not, and could not, drink whiskey. It is true that when the cure was accomplished she was well advanced into the fourth month. This symptom generally spontaneously disappears after the third month is gone; but in some rare instances it lasts throughout the term of pregnancy. It also, not unfrequently, returns during the last fortnight before delivery. The diet and drinks of the patient do not generally make much difference, yet sometimes much benefit arises from a careful regulation of them, depending for the rule of so doing upon the effects which are observed at the time they are used. Many times those who suffer most in the early months of pregnancy recover and become more than ordinarily robust, and remain so up to the time of confinement. If the nausea occurs, as is most commonly the case, immediately upon rising in the morning, we may expect to occasionally give relief by advising the patient to remain in bed until after she has had a light breakfast. If she take a cup of coffee and toast, or some crackers with it, and afterward lie down for an hour, the nausea will not trouble her for that day perhaps. Although we must refer the suffering simply to sympathetic influence of the uterus upon the stomach, there are doubtless cases in which the distress is aggravated and prolonged by complications, as constipation, unusual degree of acidity of the secretions of the stomach, or subacute inflammation of that organ. Hence we should investigate with a view to find and relieve such complications, administering the remedies appropriate to them. In very rare instances the terrible effects of continued vomiting are disastrous; the patient becoming exhausted for the want of nutrition, and from the depressing influence of nausea protracted so long that before the end of gestation she dies. Such cases, of course, require a removal of the cause of the symptom, and we are undoubtedly justified in causing the expulsion of the contents of the uterus.

Great caution, however, should be observed in resorting to such a measure, as the necessity for it is extremely rare, and in some desperate cases the condition of things suddenly takes a favorable turn and the patient recovers, and we should feel a clear conviction that it is the only means left to prevent the fatal result. In many instances the most carefully conducted measures do no good, not even to palliate the suffering, until natural or artificial labor comes to our relief, and by removing the cause proves a remedy.

Salivation is another one of the results of the sympathetic influence of the gravid uterus. It is not always, nor even generally, so far as I have observed, an accompaniment of nausea and vomiting; but the worst cases occur when there is no nausea, or, at most, present to an insignificant degree. It commences often early in the second month, and lasts to the commencement of the fifth; in rare instances it continues throughout the whole time of gestation. The quantity of the salivary fluid is sometimes small, and tenacious in quality; but occasionally there are large quantities of thin, almost watery fluid poured out during the whole day. In the night the patient is often exempt from the annoyance altogether, but not always, as it sometimes prevents the patient from sleeping soundly, and awakens her often flooded with the nauseous fluid. So large a quantity is sometimes lost as to greatly debilitate the patient, and the appetite and digestion are so much impaired as to add greatly to this source of exhaustion. The mouth, upon examination, is found in grave cases to present the appearance of ptyalism from mineral poisons; the gums are livid in color, tumid, spongy, and tender; the tongue coated with a mucous covering and swollen, and the salivary glands enlarged, hard, and tender. The remedies generally used have but little effect in relieving this disagreeable symptom. Ice held in the mouth is grateful and cooling to the heated mucous membrane; slippery elm bark will sometimes, if held in the mouth and gently chewed, soothe the membrane and stimulate the glands to more appropriate action; rubbing the gums with pulverized cinchona bark two or three times a day is occasionally palliative.

Depraved appetite, or longing as it is called by the women, is also not an uncommon symptom of pregnancy. Generally some unusual article of diet is thought of, talked about, and consumed, when procurable, in large quantities. Unseasonable vegetables or fruit of other climes strike the fancy so strongly as to almost induce monomania, and often unseemly and foolish efforts to procure them. But in other cases the coveted substance is considered, and is indeed, unfit for food. Even disgusting and unbecoming articles entirely inedible, or at least indigestible, are clandestinely procured and consumed, despite the remonstrances of her more reasonable friends. Some women are possessed with the idea that if their fancy is not indulged the child will be marked by nævi, shaped like the coveted but unprocured substance. Thus one child is marked with a strawberry; another by a spot resembling a bacon-ham; and I have one patient that exhibits, in triumphant proof of her belief, a nævus on the thigh of her little daughter that resembles a crab, because she was unable to get them to eat when she desired them so much. Other women think that the desire makes the mark, whether it is indulged or not. I need not say that I do not believe in any such fancies.

Changes in the breasts usually begin in the second month of pregnancy. Soon after the time for the recurrence of the menses has passed, the breasts become sensitive to the touch, so that the casual handling of them or the pressure of the dress attracts the attention of the patient, when she finds the glands somewhat tumid, more defined, and lobulated; and occasionally there is pain or a sense of pricking. The whole breast is somewhat increased in volume also, and somewhat warmer than natural; the nipple is more easily excited to erection, and is granular on the end. During the latter part of the second and beginning of the third month the areola becomes slightly darker in color, and from this time forward it increases in darkness until the sixth and seventh months, and thereafter, in brunettes, it becomes almost black. In blondes there is also a decided change, but the areola does not become *very* dark. At the same time the ceruminous glands about the nipple, and embraced in the circle of the areola, become quite prominent, and upon handling the breast in making the examinations, they, like the nipple, become strongly erected, so as to be greatly elevated above the surface. Their secreting activity is increased in a degree commensurate with their hypertrophy, and the surface around them is lubricated more than usual, giving the areola the appearance of being slightly oiled. During the third month another circumstance is observable, of much significance, and that is the appearance of fluid in the breasts. By properly pressing the areola and nipple, a little transparent fluid may be squeezed through the milk-ducts and made to appear on the top of the nipple in little drops. Sometimes dark spots may be seen on other parts of the breasts besides the areola. Some of the same changes, in fact most of them, may be occasionally seen in the breasts as the result of sympathy with chronic inflammation and tumors of the uterus. But the alterations of the breasts from these last causes differ from the former in the fact that the changes are not equal on both sides. One breast is larger than the other, or more tender; one, probably, has no fluid in it, while the other has, etc.

The changes of the breasts produced by pregnancy are always entirely symmetrical: the breasts increase in size alike, alter in color the same way and at the same time, have fluid in the same way, etc., etc. In the changes caused by the sympathy of a diseased uterus the breasts are not likely to retain their ordinary shape—one portion of the gland on the same side grows more than another, so that the nipple is not in the centre, as in the soft, uniformly enlarged organ.

Enlargement of the Abdomen.—The size, shape, consistence, and some other conditions of the abdomen undergo changes during pregnancy. Sometimes, during the first and second months, there is a general enlargement of the abdomen as the effect of an increase in the quantity of blood contained in its vessels, and perhaps also a more or less great amount of gas evolved and retained in the intestinal canal. I think the "bloating" so common at this time is almost entirely dependent upon the former cause, and is often observed at the time of menstruation. As before observed, this enlargement extends to the whole of the abdomen and increases the general rotundity of the cavity. The changes caused and kept up by the growing uterus are at first partial, and confined to the lower part. As the uterus sinks deeper into the pelvis the first three months, some of the intestines and the bladder, especially the latter, are also displaced—drawn downward—and the hypostatic region becomes slightly flattened or depressed, and more resonant, than before pregnancy. At the same time the umbilicus is drawn in and becomes less prominent. These two changes are greater in the third month. During the fourth the umbilicus becomes prominent as usual, and the hypogastrium slightly fuller than natural. The enlargement of the hypogastric region is quite decided during the latter part of the fourth and beginning of the fifth month, the enlargement being round and defined, and at the end of the fifth month extends to a line midway between the pubis and umbilicus, while this last is more than ordinarily prominent. The hypogastrium has also lost its resonance, and upon percussion emits a flat sound. As the uterus increases in size it spreads out, filling the iliac region. At the end of the sixth month it has risen rather above the umbilicus, and the umbilicus is more prominent. It continues to become more prominent up to the end of gestation, when it pouts out to its utmost extent. The uterus at seven months is halfway from the umbilicus to the ensiform cartilage, and by the end of the eighth month it is up to the ensiform cartilage, and subsides slightly during the ninth month, the fundus being lower at term than it was four weeks before that time.

During this increase of size in the abdomen along the linea semilunaris and linea alba the skin becomes darker, as does, in fact, the skin of the abdomen generally. Sometimes so much pigment is deposited in these places as to make them almost black. Another kind of marks make their appearance during the process of distention, which are quite characteristic of pregnancy; they very strongly resemble cicatrices. Some of them are two or three inches long, and a quarter of an inch wide, with their long direction across the walls of the abdomen from the linea alba. The larger ones are found in the sides midway from the ilium to the ribs, and the smaller at the upper part of the abdomen. These marks persist for some time after pregnancy, and remain evidence of previous utero-gestation.

A very constant symptom of pregnancy, the presence of kyesteine in the urine, manifests itself in the third month and persists until the end of pregnancy. It is a peculiar pellicle, forming on the surface of the urine when exposed to the air, and, after being completely formed, breaking up and precipitating as a sediment, re-forming, and precipitating several times before putrefaction takes place.

In order to witness the changes in the urine of pregnant women, Dr. Kane (Am. Jour. Med. Sciences, June, 1842) directs us to receive and set aside the urine in a wineglass. The room should be light and airy. This fluid first undergoes the ordinary changes, a mucous deposit to the bottom, of a light flocculent consistence, but becoming more consistent and thinner. This occupies the first and second days. In some cases, during this time, the phosphatic salts may form an iridescent pellicle that is soon precipitated to the bottom. Upon the second or third day, sometimes sooner, occasionally later, the phenomena due to kyesteine are observed. The pellicle is scarcely perceptible at first, but gradually becomes more dense and apparent, and about the fifth or sixth day it is perfectly formed. "It—the urine—now presents a creamy opaline layer of light yellow color, which grows thicker and thicker; its external surface is rendered unequal and rugged by the presence of small granulations, which are white in color and crystalline. The pellicle then resembles the layer of fat that floats upon the surface of cold broth, and it retains these characters for a long time. On subsequent days the sides of the glass are covered with small whitish streaks, varying from a line to a fourth of an inch in extent, which attest the descent of the pellicle during evaporation. The pellicle, when thick, gives off a strong cheesy odor, according to Dr. Bird, and facilitates the diagnosis. After standing for several days, it seems first to give way at the centre, and fissures extend somewhat later from this point to the circumference. Gradually small particles separate from the débris and settle to the bottom of the glass; the pellicle thus diminishes in thickness, but it seldom disappears altogether before the putrefaction of the liquor takes place; and the primary deposit at the bottom is thus increased by all the detached portions of the pellicle which gradually settle down.

"The chemical qualities distinguish kyesteine from other matters found in the urine: it is neutral, insoluble in alcohol, ether, water, and ammonia, nor is it soluble in alkaline fluids like albumen, nor like mucus, in a mixture of soap and ammonia, neither in boiling alcohol and ether, like fat. The urine containing it will not coagulate by boiling it, as albuminous urine does, but deposits a copious white powder on cooling, nor will it coagulate by the addition of nitric acid."—*Cazeau.*

The symptoms of pregnancy are not regarded as positive evidence of that condition, and we are not justified in deciding by the symptoms alone in cases where there is much at stake, and especially where the woman is strongly interested in deceiving us; yet in ordinary instances they will be satisfactory to both physician and patient. I consider the changes in the breasts, when well marked and entirely alike on both sides, connected with suppression of the menses, if the patient had *always* been regular, and an increase in the size, color, and consistence of the uterus, as conclusive in cases of *ordinary* importance; but of course in medico-legal cases they should only induce us to speak of the probability of pregnancy. Taken in connection with the physical signs, they become entirely conclusive.

The Physical Signs.—These are established by the touch per vaginam and rectum, palpation externally, percussion, auscultation, and vision. As has been already stated, the uterus is increased in size, changed in position, consistence, and color, very soon after conception. An examination by the touch in the second month should find it lower down in the pelvis; generally the cervix is in contact with the perinæum, and by passing the index finger of the right hand into the rectum, and the index and middle fingers of the other hand into the vagina, in front of the uterus, the body of the uterus may be measured with some accuracy. It will be found more than twice the thickness of the unimpregnated uterus; and if with the fingers thus placed attention is turned to the consistence of the organ, it will be found softer and more elastic than natural, and certainly very far from the great density of a fibrous tumor. An intra-uterine polypus might increase the size and change the shape and position of the organ in the same way; but, aside from the great difference in the symptoms, the polypus renders the uterine tumor almost cartilaginous in hardness. Connected with these changes, the weight and mobility of the organ are subjects worthy of close scrutiny. The unimpregnated uterus may be lifted up and moved about with *great* facility by the introduction of the index and middle fingers of the right hand. There is apparently no resistance to the motion we may impart by the quick motion of these fingers upward, forward, and backward, and from side to side. The weight is very little, of course; but within the second month the weight and mobility are very much changed; it is heavy and moves very sluggishly, and does not give the idea of the freedom and elasticity of its ordinary connections. When moved with some effort it returns slowly to its position. It should be mentioned as a fact also, that in the healthy condition of the unimpregnated uterus, in most cases, it is extremely difficult to feel the fundus of the uterus above the symphysis pubis; but in the second month of pregnancy, if it is lifted up and moved about gently with two fingers of the right hand in the vagina, we will have but little difficulty in finding the fundus with the fingers of the left pressed down into the pelvis from above. And such impulse may be imparted to it by the pressure above as to be plainly felt by the fingers in the vagina. Examinations conducted in this way will appreciate the subsequent changes in position, size, shape, etc., more easily the farther the advance of pregnancy, and their results more satisfactory. In doubtful cases the sense of sight should be brought in requisition. The color of the mucous membrane has become in the second month much darker than natural, and this color increases up to the sixth or seventh month, when it attains to its maximum. There are also visible through the speculum several small points, sometimes transparent elevations, the size of a mustard-seed; sometimes they seem scarlet red, owing to the presence or absence of their contents. These are muciferous glands, and when filled with mucus give us the appearance of a minute transparent mucous point, but when empty they are red, and contrast with the dark purple of the rest of the surface very decidedly. The cervix looks tumid and moist, with a superabundant secretion, and the mouth decidedly enlarged and unshapely, losing the regular form and becoming puckered.

Palpation of the abdomen, separately or combined with the vaginal touch, affords us much valuable information. With the two fingers in the vagina, and the other hand applied to the abdomen over the pubis, the uterus may be measured before it has fairly arisen from the pelvic cavity; and even after it reaches much above the pubis, it sometimes is so soft that it may escape detection, or give at most a doubtful sensation by mere palpation. There is no time until after the sixth month but that the vaginal touch adds greatly to the impressions produced by palpation, when the two are practised together. Percussion practised in connection with palpation very much increases the definiteness of the results, by more clearly defining the boundaries of the tumor. When examined by palpation, touch, and percussion, the uterine tumor presents a balloon-like shape; it is elastic, obscurely fluctuating, and the tumor above the pelvis may be ascertained to be continuous with the tumid cervix in the pelvis by motion applied to either part being imparted to the other. Two more marked peculiarities of the uterine tumor, as felt above the pelvis through the abdominal walls, are the hardness caused by the hard portions of the child being easily felt in the last two months of pregnancy, and the change in the consistence of it produced by the contraction of its own muscles. A little attention to the tumor by pressing the fingers steadily upon one point will enable us to feel it contract and become quite hard, and again relax and become quite soft; and, very generally, to merely keep the flat hand upon a large part of it will enable us to feel this recurring hardness. It is a fact long since noticed, that the uterine muscles are contracting and relaxing in a gentle manner pretty constantly for several months prior to labor. These contractions are not general, but may be confined to comparatively a small part of the organ. The impregnated uterus differs in shape from an ovarian tumor:

it does not fluctuate as clearly, is softer when not contracting, and harder in places and at times when the muscles contract. It is very much the shape of a distended bladder, but fluctuation is more obscure. The distended bladder is not so broad, ordinarily, as the impregnated uterus that rises to the same elevation in the abdomen; and the diagnosis may be made positive by using the catheter in the bladder. When the abdominal walls are very thick, rigid, or irritable, these diagnostic evidences are not so clear as to demonstrate the existence of pregnancy; but some of them are very valuable, and will ordinarily entirely satisfy us. The signs which demonstrate unequivocally this condition are derivable from the movements of the child, either active, passive, or vital. We may, in fact, be deceived in very rare instances by relying upon proof dependent upon any one sign except the pulsations of the circulatory organs in the fœtus itself; and in cases where matters of grave interest are at risk, as the reputation of a person of previous good character, large pecuniary interests, or life and death, etc., the physician should not be induced to commit himself positively unless he can hear the heart of the fœtus unequivocally, not only once, but at repeated examinations. For the most part this cannot be done before the fifth month.

The active movements of the fœtus may be felt by the mother before they can be detected by an observer, and, when she has no motives for deceiving, are generally valuable; but in very many cases, unfortunately, the testimony of the woman is entirely unreliable. Women are *often* deceived themselves, mistaking the movement of gases in the intestines, or the movement of the abdominal muscles, or, indeed, imagining she feels movements that do not occur at all; while in other more rare cases they make every effort that a morbidly acute ingenuity can invent to deceive us. The first sensation produced by the motion of the fœtus in utero, experienced by the mother, is called quickening, because it was supposed by ancient observers to denote the time when life entered the fœtus; they believed that previous to this nature was merely fashioning the organs for the capacity to receive this precious endowment. Now, however, the tyro in physiology is aware that at the time fructification is complete the vital principle has begun its work in the organism, and that *all the future changes* wrought by it are but phases of human existence; the ovum, the embryo, the fœtus, infant, child, man, are only the same living being in different stages of existence, and until we are prepared to consider the life the same in all these conditions we misapprehend the subject. It is, therefore, as much murder, morally, to arrest the vital action in an ovum an hour after fructification as it would be to strangle the newly born infant.

The first motions felt by the mother are different in different instances; in other words, quickening is experienced differently at different times and by different persons. There are observed at least two different methods of its occurrence. Perhaps the most frequent mode in which this experience affects the mother is the more gentle one. She first feels an unusual motion in the pelvis. After it has passed she doubts whether it was actually a movement. After the lapse of an uncertain period, sometimes only some moments, sometimes hours, and occasionally days, the gentle but equivocal sensation is again experienced. This is repeated until there can be no question of the reality of it, and henceforth active motions become stronger, until before the end of gestation they are sufficient to annoy and even sometimes give pain. The most sensitive women are likely to experience quickening in this manner. When it is established in this gradual way it may be that the motion will be first perceived at the middle of the third month, and, I think, often at the beginning of the fourth. But the other method of the establishment of the symptoms of quickening is quite different. The first sensation experienced by the woman is a sudden feeling as if some viscus had given way from its position and been misplaced. Although the perception may be undefinable, yet it is very decided; and in many instances the effect upon the nervous system is so marked as to cause syncope or hysterical symptoms, or great terror lest some accident has happened that may prove disastrous. After the first shock has passed away the gentle sort of movements I have described above become apparent, and continue to increase up to the end of gestation.

The first described motions, so gentle and uncertain, in the early sensations of the mother, are doubtless caused by the movements of the fœtus; while the last or strong perceptions are the results of the sudden dislodgment and upward movement of the uterus from its pelvic and rather crowded nidus. It becomes in some instances as it were impacted in the pelvis, growing into the inequalities of that cavity until, filling it up, it is slightly fixed in position, and by a quick movement on the part of the woman the weight of the superimposed viscera is to some extent removed from its fundus and it rises up. The stooping posture, or forcible and great elevation of the arms and shoulders, whereby the diaphragm and chest are removed farther than ordinary from the pelvic brim, are favorable to induction of this sudden dislodgment of the uterus. This sudden and decided establishment of the mother's perception connected with pregnancy is a later phenomenon, and is not likely to take place until about the middle of the fourth month. We may account for the decided difference thus observed in the experience of pregnant women from the consideration that in the first kind of quickening the uterus commences rising earlier from the cavity, and coming in contact with abdominal muscles which are more sensitive, the perception of movement is more readily recognized by the mother, and that this rising is gradual; while in the second variety, probably from the fundus of the uterus being directed too much backward, and as it grows fills up the hollow of the sacrum, so as to be detained somewhat by the promontory of this bone, until by the consentaneous upward movements of the perineal muscles, the abdominal viscera and thorax, an impetus of elevation is imparted that brings it in the correct position to rise out of the cavity entirely.

To the observer the movements of the fœtus are not perceptible with any certainty until pregnancy is well advanced into the fifth month, and even until in the sixth month they may very easily be confounded with motions of the muscles of the lowet part of the abdomen. The fœtus is often so quiet that it will require a great deal of attention to discover its movements, and there may be intervals of hours, and indeed days, when we should fail by ordinary diligence to perceive any motion; this is not generally the case, however, as it is common to feel the movements every few moments. When the fœtus is so still as to not give signs of its presence by any kind of action, we not unfrequently prompt it to do so by placing our left hand flat upon the abdomen and pressing downward with some firmness and striking it a smart stroke, as in percussion; or by placing one hand upon either side of the abdomen and gently squeezing the uterus between them; or by simply placing the hand, made very cold by having been immersed in ice-water, very suddenly upon the abdomen. All these expedients will sometimes fail to excite the movements, and it will be necessary to sit with the hand upon the abdomen and wait perseveringly until the little creature moves spontaneously. After the movements become sufficiently vigorous to enable us to recognize their character, it will be easy for us to divide them into two kinds. The most frequent, perhaps, is the sense of a sudden shock, as if a foot or hand had been forcibly struck against the walls of the uterus on the inside. This kind of motion is more frequently repeated up as late as the eighth month, and during the ninth month it is not proportionately so common. The other sort of movement is the gliding or rolling motion, and imparts to the hand the idea that the fœtus turns over or changes its position by moving its whole body. Some part of the uterine tumor assumes a greater prominence than the rest, perhaps at the side; the prominence moves from the part first observed slowly across the abdomen for some distance and then subsides, as though a shoulder or hip had been passed across beneath and elevated the parts above in its transit from one side to the other. A variety of this kind of motion doubtless is caused by the change of position of the arm or leg without the whole body moving. This rolling or gliding motion is felt more frequently and obviously during the last two months of pregnancy, and especially the last. The motion of the fœtus in utero is felt more obviously in the last months of pregnancy, because it is constantly becoming stronger, and the liquor amnii decreases in quantity and permits the approximation of the abdominal walls and the fœtal surface, and we may, when desirable, bring about this approximation by changing the position of the mother, so that the abdomen may be somewhat pendent, as upon her hands and knees, or stooping over a chair and supporting herself with her hands on the chair. The abdominal muscles must be relaxed and quiet, or we may be deceived by their contractions. Other very rare kinds of movements may be occasionally noticed, such as general tumultuous action, as if in convulsions, all parts apparently violently agitated, or a measured jerking motion of some particular part or the whole bulk of the fœtus, not unlike the movements of hiccoughing. All these varieties have their grade of intensity; in some cases they are so feeble as entirely to escape the perceptions of the woman, and defy the efforts of detection on the part of the practitioner, while in others the movements are vigorous and appear constant for many of the last weeks of pregnancy, annoying the woman greatly, and preventing her sleep to a distressing extent. Sometimes the movements, after having been active and decided, entirely cease to be obvious to the consciousness of the mother or an external observer, and after having been suspended in this way resumed. Or even there may not be any decided and manifest motion for days before confinement, and the child be active when born; but, as a general thing, complete cessation of motion is an evidence of the death of the fœtus.

Ballottement or passive motion is another means of great value in determining the presence of fœtus in utero. It consists of the act of causing passive motion of the fœtus in such a way as to perceive it. Ballottement is easiest accomplished during the latter part of the fifth, and the sixth and seventh months, because the liquor amnii is abundant enough to permit the fœtus to be moved about by the hand, and the fœtus large enough to be readily perceived. The woman is placed upon her back or in the erect posture, the last preferable, and the practitioner introduces the index and middle fingers of the right hand until they come in contact with the uterine tumor; ordinarily the hard, round bulk of the head will be detected lying a little anterior to the os uteri. The two fingers are made to support the head thus situated for a moment, and then, by a rapid upward motion of them, it is displaced and raised off the wall of the uterus upon which it rests. The liquor amnii will immediately occupy its place. If the fingers are kept in place, as before this movement, upon the most dependent part of the uterus, they will receive the sensation of an elastic tumor instead of the hard one before the head was raised up; but by keeping them in position a very short time the hard body may be felt gently settling down upon them, and the soft elasticity of the moment before is gone. This is what is called by the French ballottement; I know of no English word that conveys precisely the same meaning. The word toss comes nearer to it than any other. This tossing should be repeated a number of times, in order that the impressions received from it may be unquestionably established. It is a valuable sign, and yields only in importance to the sounds of the fœtal heart. It is thought by some that a stone in the bladder might, under certain circumstances, be mistaken for the movements of the fœtus under the operation of ballottement; but the circumstances must be very peculiar, and so exceptional in their character as to be of little account in making a diagnosis. For the purpose of ascertaining definitely the consistence and size of the uterine tumor, examination per rectum is of the greatest importance. The finger will sometimes appreciate more exactly these qualities through the rectum than the vagina, and ballottement may be performed through it.

Auscultation.—Some of the results of auscultation are demonstrative and entirely reliable, while others are not so positive, but afford very strong presumptive evidence of the existence of pregnancy. The position on the back, with the limbs semiflexed and somewhat separated from one another, and the head and chest bent forward by elevating them on a pillow, is sufficiently appropriate as a general rule; but it is quite necessary to vary the position in cases of doubt or great importance. The erect posture will often afford more satisfactory results than this, and in rare instances we may detect with much more distinctness the sounds of the heart and vessels if the patient lean strongly forward, or even place herself on her hands and knees, so that the fœtus may gravitate toward the anterior wall of the uterus. Whatever the position, the abdomen should be covered with a very light and thin cotton garment, or entirely naked. There should be no starched, silken, or woollen substance on the surface, to obstruct the transmission or mask the sounds. Habit will for the most part govern the practitioner as to the choice of mediate or immediate auscultation. The stethoscope—especially the flexible double-tubed instrument—is preferable on some accounts to any other instrument or the unassisted ear. The accoucheur can retain a more easy position, and is not obliged to come in contact with the person of the patient, while the sounds are generally rendered more distinct. On the other hand, immediate auscultation will be preferred by some, because the sounds perceived are natural in intensity and other qualities, and the contact of the head with the abdominal walls is one of the best methods of discovering the movements of the fœtus, a large surface being pressed firmly against the abdomen of the woman. The pulsation of the fœtal heart may be sometimes heard at the fifth month, though we need not be surprised if at the commencement of the sixth month it is still uncertain, and difficult to arrive at a positive assurance on this head. It becomes more obvious and easily found as pregnancy advances, until at term there is but little difficulty in detecting it, and its relative position to the person of the mother.

In examining for the pulsation of the fœtal heart in the fifth and sixth months, the stethoscope should be placed over the centre of the uterus, as the liquor amnii is so abundant as to permit the gravitation of the fœtus to this part of the uterine cavity. In the eighth and ninth months it may more frequently be found at the left side, midway between the anterior superior spinous process of the ilium and the linea alba at the umbilicus. It should be remembered, however, that while the above remark is true in reference to the more common position of the pulsations, they may occasionally be heard in every other portion of the uterine tumor; hence, when not detected in one place the instrument should be moved about slowly and carefully until the whole of the parts have been entirely and attentively examined; and if we fail at one patient effort to elicit anything positive, we ought not to allow ourselves to be betrayed into any decided opinion without two or three repetitions of it. And if the sounds are not detected, it yet is not proof positive that there is not a living fœtus in the womb. At term an inability to detect the sounds of the fœtal heart is, however, strong presumptive evidence that life is extinct. I once however saw in consultation a melancholy assurance of the fallacy of relying upon this negative sort of testimony. In the case referred to the practitioner, who is an intelligent and entirely reliable physician, assured me that up to within two hours of the time when I was sent for he had repeatedly heard the heart pulsating in the left side below a level with the anterior superior spinous process of the ilium, but that for two hours it had ceased to beat, and after the most careful and painstaking efforts I could neither detect pulsation of the heart, uterine souffle, nor the movements of the fœtus. After waiting another hour or more, perforation of the head and delivery was performed, when the child cried and breathed for half an hour, to the intense mortification and chagrin of the two medical gentlemen concerned in the case. Too great caution cannot be exercised in such cases when we are by other circumstances permitted to choose between methods of delivery.

The sounds of the fœtal heart may be compared with great propriety to those of the adult heart. They resemble them precisely in everything but strength and frequency. The fœtal heart pulsates more rapidly,—perhaps with double the frequency of the adult,—and its sounds are much more feeble and less audible. I know of no sound with which I can compare these sounds as apt and applicable as those mentioned. They certainly do not resemble the ticking of a watch, and I am not sufficiently familiar with the sound of the heart of a pigeon to judge of the similarity with them. In some rare instances it is possible to experience some difficulty in distinguishing between the pulsations of the hearts of the mother and fœtus, but we may easily solve the question by placing our finger on the radial artery, or our hand over the heart of the woman, while our ear is applied to the uterine tumor, and attend to the correspondence of the pulsations in the two localities. If caused by the maternal organs they will be synchronous, if by the organs of two individuals they will differ in time decidedly. When pulsation of the fœtal heart is detected unquestionably, the demonstration of the existence of pregnancy is complete and wants no confirmation. The proof, indeed, can be no stronger until the expulsion of the fœtus is accomplished. Multiple pregnancy can sometimes be pretty clearly diagnosticated by attention to the locality of the pulsating sounds. We may hear one heart beating on the left, for instance, and one on the right side of the abdomen, perhaps at different levels, and with different distinctness, vigor, and frequency. The position of the fœtus at term can be to some extent ascertained by observing attentively the place where the pulsations are loudest and appear nearest the surface. When the head presents, the heart ought, at the beginning of labor, to be heard most distinctly below the umbilicus, and nearly on a level with the anterior superior spinous process of the ilium. If the occiput is in the left side of the pelvis the sounds are to the left of the linea alba; if the occiput is in the right side of the pelvis the sounds will be on the right side of the linea alba; should the breech present, the sounds will be higher up. There can be no doubt that occasionally we may detect deviations in the sounds of the pulsation of the heart, caused by disease of the fœtus. Dr. Whitehead, of Manchester, England, found that the pulsations were decidedly slower in some cases where there was congestion of the uterus, with a strong tendency to premature delivery. Alcoholic stimulants given to the woman, sufficient to cause considerable excitement, will quicken the pulsation of the fœtal heart, and I have on more than one occasion observed a retardation of them from full doses of opium. The first instance I saw in which this change was decided was in a patient narcotized for dysenteric symptoms. The pulsations of the fœtal heart were reduced to eighty in number.

Souffle of the Cord.—In the latter weeks of pregnancy, when the liquor amnii is small in quantity and the fœtus is in close contact with the uterine walls, and pretty firmly fixed in its position, the careful auscultator may be fortunate enough to hear the pulsation, or souffle, in the cord. The sound, which was first described by M. Nagéle, Junior, resembles the blowing sound heard by placing the stethoscope over the carotid artery in chlorotic girls, and is supposed to be caused by the circulation of the blood through the umbilical arteries. It becomes more obvious after the liquor amnii has been discharged, and is generally, though not always, heard near the head of the fœtus. The cord is brought up to the uterine walls, and slightly compressed between them and the fœtal surface by being wound around the neck or some of the limbs of the fœtus. It may be distinguished as a sound produced by the vessels of the fœtus by its frequency. In connection with other signs of pregnancy it is confirmatory. No significance, however, should be attached to our inability to discover it at any time.

Placental, Uterine, or Abdominal Souffle.—The difference of opinion as to the vessels in which this singular murmur is produced, has given rise to a diversity of names in connection with it. At present I think the most we can say in reference to the particular vessels it is heard in is, that they are maternal. There is no doubt but the circulation of the blood in the maternal arteries causes the uterine murmur. From a consideration of the subject, as discussed by the most recent and learned writers, coupled with my own observations, I believe it to be produced by the blood traversing the uterine arteries in the neighborhood of the placenta. There is greater vascularity of the uterus at the part where the placenta is attached, and the amount of blood circulating in the uterine arteries, at and in the neighborhood of the placental attachment, is probably equal to all the rest in that organ. There are plausible facts as well as theoretical reasoning in the opinion expressed by some authors, that this sound is caused by the blood circulating through the arteries in the abdomen outside the uterus. Some suppose that it is transferred by the uterus, as a medium of sound, from the aorta, which is slightly pressed between the pregnant womb and spinal column, or the iliac arteries similarly compressed. Another opinion, supported by ingenious reasoning and plausible facts, is that this sound is caused by the blood circulation in the placental substance. There is a general resemblance between the sounds caused by the arterial circulation in all localities, and it will be a happy accident or exceedingly ingenious experiment that satisfactorily demonstrates the exact seat of this phenomenon. Meantime practical men are in possession of all the facts of value attached to it as a diagnostic sign of pregnancy. The sound, as usually heard, is a somewhat prolonged blowing murmur, not unlike—using an old but apt comparison—the cooing of a dove, or the pronunciation of the word *who* in a loud whisper. Whatever comparison may be used, the only way to form a correct appreciation of its characteristics is to hear it, and the student should embrace every opportunity to hear and attentively consider its peculiarities. It is very remarkable how the sound varies in the same subject at different times, and the changes that it suddenly undergoes while it is under observation. In some persons, and at some times, the sound is very loud, indeed roaring so boisterously as to be called the *bruit de diable*, or devil's sound; at other times it is soft, and so distant as to give the idea that it is far removed from the ear. And the loudness of the sound sometimes varies from this most delicate murmur, scarcely perceptible, to the loud tumultuous roaring, within a few moments. Generally it is a mellow, easy-flowing, continuous sound, but sometimes sharp, whistling, and shrill. Indeed we must not be surprised at, or deceived by, any *outre* manifestation in this respect. One thing is constant—the synchronousness of the sound and maternal pulsation. Because it is not detected at one careful examination we should not infer that it is not present, for the quietness of one examination may be replaced by the loudest souffle the next. And because we are unable to find it in a second, third, or even fourth examination, is no reason to doubt our former perceptions.

In the latter months of pregnancy the more common position in which this sound may be observed is near and rather above the centre of the uterine tumor; but numerous exceptions occur in this respect, and we occasionally hear it at the fundus, and, in rare instances, at the pubis. This corresponds with what we know to be the difference in the position of the placenta, as it is not uniformly implanted on the part of the uterus. The uterine souffle is recognized earlier than the sounds of the fœtal heart, active movements, or the passive movements of the fœtus. With adroit use of the stethoscope it is sometimes detected during the latter part of the third month. The instrument, at this early period, must be pressed down into the pelvis from above the pubis, so as to make the abdominal muscles approximate the uterus as closely as possible. It is valuable as a sign of pregnancy, especially as it may be discovered early, but it cannot be allowed the important position of demonstrative evidence.

I cannot dismiss the subject of the diagnosis of pregnancy without advising the student against many deceptive influences. In ordinary instances the patient will have no interest in either deceiving herself or her friends, and will fairly express herself in reference to the many points with which she alone is acquainted; but in some cases the great anxiety to be a mother causes her to observe with intense sensibility every symptom that might prove the existence of her coveted condition. She thus deceives herself by discovering sensations that do not in fact transpire, and exaggerating the doubtful into very obvious symptoms. We not unfrequently, in addition to this honest class of patients, meet with the crafty interested woman, whose intelligence especially qualifies her to influence our opinions, that will entirely fill the required list of phenomena, and establish pregnancy undeniably if we rely upon her testimony alone. If her interest demands an opposite course, she may conceal to a very late period her actual state, in spite of our efforts to discover her secret. Let the practitioner, therefore, not be betrayed into a more complete diagnosis than positive evidence justifies. If the patient is less than three months pregnant, it is never advisable to give a definite opinion, because it is simply impossible to be certain; and I am quite willing to acknowledge that until the fifth month I am afraid of being in error if I take a positive position, and will never give more than a doubtful decision to any questions submitted to me. The fact is, I hold no man justified in giving a positive decision for or against the existence of pregnancy until he has satisfied himself, beyond a reasonable doubt, that he has heard the pulsations of the fœtal heart. By all this I do not intend to deter the student from definiteness in most cases of pregnancy. We can, when nothing but ordinary circumstances surround the case, and our decision is to be given as a guide in matters of minor importance, venture upon a reasonable assurance; but, as is sometimes the case, when great estates, life, or character is in the scale, great caution will be our only safety. No matter how important an early decision, we should remember it is useless if doubtful.

DURATION OF GESTATION.

Forty weeks, or two hundred and eighty days, is generally conceded by observers of most experience to be the length of time from conception until labor begins. This is the average duration, but it is also by common consent determined that much deviation from this period actually obtains. Dr. Merriman's table shows that in one hundred and fifty mature births, five were observed to take place as early as the thirty-seventh week, while eleven were deferred until the forty-third week. Dr. Merriman reckoned from, but without including, the last day of the menstrual flow. Dr. Murphy shows that in five hundred cases of labor twenty-three occurred in the thirty-seventh week, while six were deferred until the forty-fifth week. Dr. Murphy calculates from the last day of menstruation. Dr. Reid collected forty-three cases of labor in cases of gestation that were originated by a single coitus. One child was born on the two hundred and sixtieth day, and one as late as the three hundredth day, showing a variation of forty days in the period of gestation. It would be easy to multiply statistics of observation, but, so far as I have been able to collect them, they all serve to establish the times I have mentioned as the ordinary average, and the most common extremes of the duration of pregnancy where the children are borne to maturity. A question of great interest in connection with the duration of pregnancy is, how much may this variation be increased by premature labor? Without quoting cases of the most early viability of the fœtus on record, it may be stated that the child can live with something of certainty at the end of the seventh month; and we may with plausibility suppose that as much latitude of calculation will apply to the period of viability as to maturity of the fœti of different vigor. If this is allowable, we may subtract two months of thirty days each from two hundred and sixty days, the extreme brevity of duration, and we have two hundred days left. Taking the extremes as thus established, and we may have a variation in the time of gestation, terminating in the expulsion of a viable child, of one hundred days, or, counting the difference in these extremes, a variation of thirty-three per cent. of time. We find support in the calculation of considerable variety in the duration of gestation, terminating in mature children, by an equivalent average difference in the duration of pregnancy in domestic animals. Quite as much difference is observed in the cow and the mare. In the former, sometimes a difference of six weeks, or even more than this; and in the latter, two months. It is usual to count from the time menstruation ceases.

MULTIPLE PREGNANCY.

Not unfrequently two fœti are developed simultaneously. One case of twins is said to occur in every eighty-seven cases of labor, and in seven thousand six hundred and nine cases, triplets are born, and at long intervals four and even five children have been the fruit of one pregnancy; but these cases are so very rare that the average frequency with which they return has not been determined. The conditions under which multiple pregnancy occurs are not always the same. Twins are sometimes generated by patients having a double uterus or a bifid organ, but much more frequently in a uterus of ordinary anatomical peculiarities. So far as the mother is concerned, the circumstances connected with generation differ from ordinary instances more in the condition of ovulation than anything else. There is more than one ovum produced, or else a double ovum. It is believed now that the Graafian vesicle may sometimes contain two or more ovi, and also that more than one ovisac may mature and discharge its contents at a menstrual period, either from one or both ovaria. The ovi produced by the mother, fructification may be the result of a single coitus. It is not difficult to understand how this may occur, when we remember the very small amount of semen necessary to fecundate an ovum. But we are assured also, that sometimes the two ovi are fecundated by the semen of separate individuals. A number of authors mention labors at which a mulatto and white child were born of the same woman. Dr. Meigs mentions a case of this kind, in which the woman acknowledged having had sexual connection with her husband and a negro within a few hours. But Prus, as quoted by Joulin, mentions the birth of a double-headed monster with a white body, one white head, and a head entirely mulatto in features, hair, and skin. There seems to be quite a tendency to twins in some families, probably hereditary; and if a woman has had twins she is very likely to do so again. I have a patient who had twins at her second labor; in twenty months after, miscarried of twins at about three months, and had twins as the result of her fourth pregnancy and third labor. The development in multiple pregnancies is very much the same as in single cases. Each fœtus has a separate chorion and amnion, but they are both or all generally surrounded by a single deciduous membrane. When we call to mind the fact that the two first membranes are developed out of the structures of the ovum, while the latter is the product of the uterus, this is no more than we should be prepared to expect. The cords and placentæ are distinct from each other, but very nearly always the placentæ are in close proximity, and the edges, where they touch, are thicker and crowded together, so as sometimes to have the appearance of being connected; but the vascular system of each is entirely separate from the other. One or two instances are on record where there was vascular connection between the two, but they are exceedingly rare. As will be seen by the figure, twins occupy the vertical position in the uterus, but instead of the head of both being down, the breech of one usually lies on the brim of the pelvis, while the head of the other is situated above. Sometimes, however, the heads are both down, or both up. They lie by the side of each other instead of one before and the other behind. The diagnosis of multiple pregnancy is not always, though generally, possible. The patient is larger than usual at the same period of gestation; the uterus is broader; the limbs and heads of the two may sometimes be felt by an expert manipulator through the walls of the abdomen, but by far the most reliable evidence is derived from the locality of the sounds of the heart. Ordinarily one heart may be heard on one side below the umbilicus, while the other is recognizable on the opposite side above that point. But the only positive assurance that the sounds proceed from two individual hearts, is hearing the two sounds on opposite sides. To be certain that the sound of one heart is not conveyed across the uterus, it will be

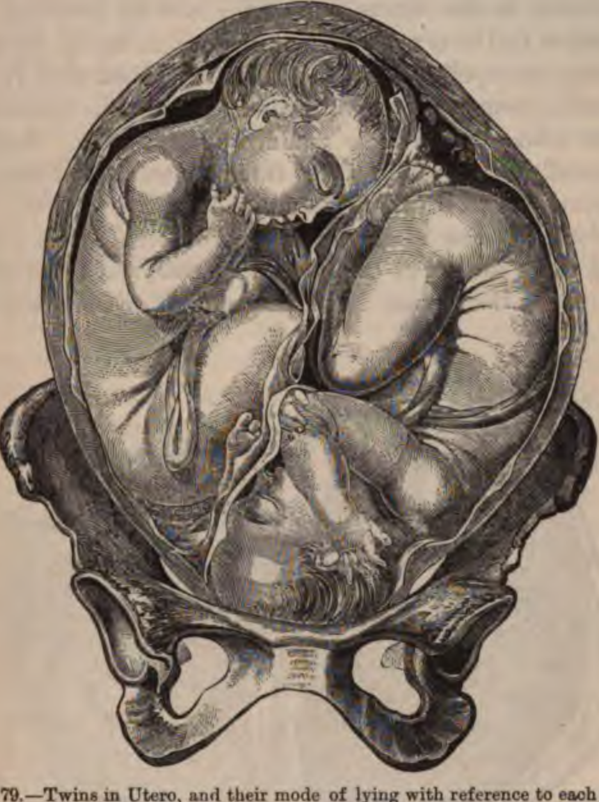


FIG. 79.—Twins in Utero, and their mode of lying with reference to each other.

necessary to survey the space between the points where the sounds are loudest; when, if there are two hearts, there will be a point where no sound can be heard, or where both may be detected, giving different quality of pulsation both in time and intensity. The *progress and prognosis* of multiple pregnancy is not quite so favorable as single gestation. The uterus, developing more rapidly, becomes so distended that it is provoked to the expulsion of its contents before the end of the usual time, hence the children are less likely to live; the ante-partum pressure and other effects of uterine development are greater, and the post-partum changes are generally more intense and attended with greater risks. Again, premature labor is likely to be brought on by the death of one of the fœti, and thus both be lost; sometimes, however, one fœtus dies early in pregnancy, becomes mummified, and remains in the uterus during the rest of gestation, and is delivered at full term with the mature one; or, rarely, the defunct fœtus may be expelled while the other is retained until full term. And lastly, from unknown or ordinary causes, one fœtus may be expelled while the other is retained nine months. Both twins are generally developed in a very similar manner, but many cases are observed in which there is quite a difference in size. This is particularly the case when they are of different sexes. In most cases of twins the sex of the two is the same, and there are more female twins than male. The placentæ of twins are separate, but are generally contiguous to each other at the edges. Sometimes their structures are commingled, so that it is difficult to separate them, but the systems of vessels are in such cases distinct. They are almost always expelled together after the birth of the second twin.

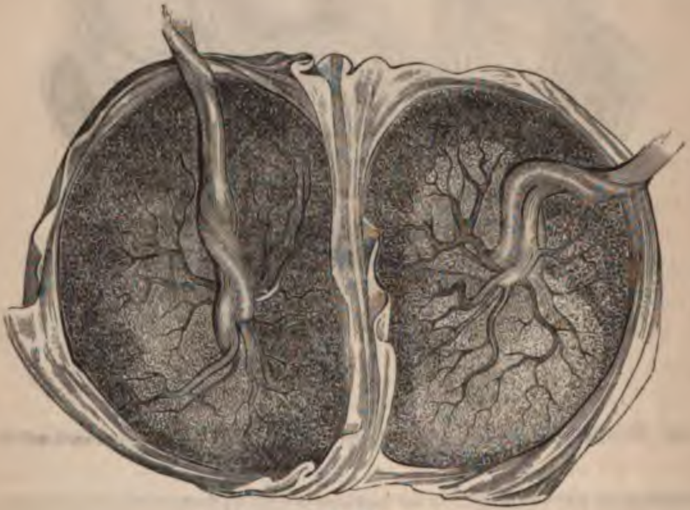


FIG. 80.

SUPERFŒTATION.

By this term is meant instances in which conception takes place in the uterus while one fœtus is in process of development. There are very few cases on record where this is conclusively established to have occurred. Perhaps one, as clearly proven as has been recorded, is given by Dr. Tyler Smith, in "a young married woman, who, pregnant for the first time, miscarried in the fifth month, and a few hours afterwards a small clot was discharged, enclosing a perfectly fresh and healthy ovum of about one month. There were no signs of a double uterus in this case. The patient had menstruated regularly during the time she had been pregnant, and was unwell three weeks before she aborted." Another case is mentioned, of at least plausible appearance, by Professor Eisenman, of Strasbourg, of a woman who was delivered of a second child one hundred and forty days after the first, both having been mature. It is not difficult to explain the possibility of superfœtation in women with double uteri, or with even bifid organs; and there does not appear to be any serious anatomical obstacle in the early stages of gestation, in ordinary instances, when it is remembered that the decidua vera does not close the os uteri or the openings to the Fallopian tubes, and that the reflexa does not entirely fill up the uterine cavity until the end of the second month. While I should investigate every case of apparent superfœtation with great care before admitting it a place in that category, I think there is not much doubt but that very rare instances do occur.

We not unfrequently meet with cases in which a woman is delivered of two fœti of different degrees of development, or rather different size. Women sometimes miscarry of a blighted ovum, and carry a second of the same conception to full term; or two may be expelled at full term, one being blighted and of early development only, while the other is healthy and fully grown. Apropos of this subject, it may be said that in multiple pregnancies each ovum may be, if it not generally is, the subject of separate acts of fructification and conception. A negro and mulatto child may be born twins of a black woman, or a white and mulatto by a white woman. I saw an instance of this kind in the person of an unmarried Irish woman, who admitted to me that after sleeping with a negro she had coitus with a white boy sixteen years of age, early in the morning. The boy had red hair, and so had the white child, although the girl's head was black.

GENERAL PATHOLOGY AND THERAPEUTICS OF PREGNANCY.

It might, *à priori*, be supposed that pregnancy must influence to a considerable degree the general condition of the woman,—her susceptibilities to and immunities from disease; to modify the nature of the attack and progress of disease; her capacity to recover from it, and the efficacy of the treatment necessary for its cure,—and such is the case. But pregnancy does not produce like changes in the general or special conditions of all females. Some, when they become pregnant, enter into a state of absolute invalidism, and can hope for no cure but delivery; while others are as certainly improved in health. If in an ordinary way they are debilitated, nervous, and miserable, they become robust, hopeful, and energetic during pregnancy. We meet with still another class of women, in whom pregnancy causes very little change; they are uniformly healthy in this condition or not. The want of uniformity in the character and degree of effects caused by pregnancy is no more than might have been expected from the great diversity of organization, and will probably teach us not to attribute too much of the sanitary condition of a woman to pregnancy alone. With these considerations as cautions, it is profitable to examine somewhat in detail the most common deviations from the ordinary condition of the pregnant. In doing so I must content myself with a mere allusion to them in the very shortest possible manner to be practicable. I am convinced from my own observation that pregnancy generally bestows a comparative immunity from attacks of epidemic disease. I mean by this, that during the prevalence of cholera, small-pox, and other epidemics, pregnant women are less liable to attacks of these diseases than the unimpregnated; but sometimes it increases susceptibility to a particular epidemic disease or tendency. Jaundice has on two occasions within my experience been epidemic to a limited extent among the pregnant, and occurring in but few patients in an unimpregnated state. When pregnant women become the subjects of epidemic disease they suffer more than other patients; but there are exceptions to this remark, especially with reference to cholera. The increased danger of acute disease is probably not so much owing to the presence of pregnancy, or even the modified condition of the patient caused by it, as the frequent complication of abortion. Any disease in which the nervous susceptibility or vascular action is much greater than natural, if it continues for any considerable length of time, is very likely to interrupt the processes of gestation; and the puerperal state of the uterus, peritoneal surface, blood, and nervous system thus produced, renders an attack of some form of puerperal disease a probable consequence, which, in connection with the pre-existing affection, makes the prognosis much worse. But aside from the puerperal conditions as complications of acute disease, there are states of the system which render attacks of disease, especially of a particular kind, more dangerous than they would be in the non-pregnant woman. There can be no question, from the phenomena generally observed, that the excitability of the nervous system is enhanced very decidedly in pregnancy, and, as a consequence, the susceptibility to the excitement caused by disease increased. This "nervousness," as the patients themselves generally call it, is very apparent in a large majority of pregnant women, manifested by vertigo, fainting, nervous starting, being easily alarmed and excited, odontalgia, neuralgia, disorders of vision, etc. The mind, its affections, sensations, and the nerve force, all are generally more or less affected, almost always exalted, generally perverted; hence mental diseases and nervous affections originate not unfrequently in pregnancy, on account, perhaps, of a predisposing condition, receiving strength from the susceptibility thus added. Every pathologist will understand, also, that if there is not predisposition to mental or nervous affections sufficient to give rise to a special disease of this nature, that this state of the nervous system must modify unfavorably some kinds of intercurrent disorders. The circulation is quickened to quite a decided degree in most cases of pregnancy, the pulse beating more frequently and generally with more force and fulness, so that the blood circulates more rapidly and in larger quantities through the organs, and not unfrequently palpitation often floods them with still a greater amount of blood. MM. Andral, Cazeau, and others have shown that the blood in pregnant women is poorer in red corpuscles than the average, and reversed the idea which so long obtained that pregnancy causes plethora, and quite clearly proved that comparative anæmia actually exists. But there is another investigation in this connection open to physiologists, of very great interest, and that is, whether there is not associated with this paucity of globules actual increased nutrition? My own idea of the facts is, that this is the case. How frequently do we find that women who are pale, delicate, and white after conception, and especially as pregnancy advances, become full-featured, red, and even so much do these changes occur that they have a coarse appearance. And when we examine the actual development of the different parts of the system, the limbs are larger, the superficial vessels are fuller, the muscles are harder, and there is an increase of adipose tissue. The woman thus changed in appearance is stronger, more capable of enduring fatigue, and her functions generally are more actively and energetically performed than in the non-gravid state. If the blood of such women is impoverished, and the red globules are less numerous, anæmia, in the ordinary acceptation of the term, is not incompatible with increased vigor of body and mind, and an enhanced state of nutrition. These are not rare exceptions to the general rule, but among the active women of the city, and most of them in the rural districts, they form a majority of the whole. Another fact in this connection, somewhat exceptional to the ordinarily received ideas of anæmia, is that acute inflammation is more rapid in its course, more intense in its nature, and requires to be combated with more energetic measures in pregnancy than in the unimpregnated state (Tyler Smith). Corresponding with this fact is another of great significance—the appearance of the buffy coat on the blood of pregnant women not laboring under inflammation. I shall not attempt to reconcile these facts with the present pathological doctrines—or, at least, those entertained by many eminent pathologists—that inflammation is more intense in the plethoric.

The condition of the system connected with and dependent upon gestation affects the course of many diseases existing previous to its occurrence, or that supervene before it has terminated. Since the time of Esquirol, who taught the doctrine, the opinion has generally prevailed among medical men that mental affections were decidedly influenced by the occurrence of gestation,—generally favorably. Esquirol gives instances, and more modern ones may be found scattered through the literature of the profession, where chronic insanity has been interrupted, sometimes entirely, at others only temporarily, by the occurrence of pregnancy. It is more frequently after the middle of the term of gestation that the amelioration begins, but occasionally earlier. We should remember in this connection also that lunacy originates during pregnancy sometimes; that there is so great a tendency to it at the end of this condition that writers have given the name of puerperal mania to lunacy occurring in or near the puerperal state. Both these facts serve to show the influence exerted by pregnancy upon the mind and its affections. General nervous disorders are often very decidedly influenced by pregnancy. Some women are subject to some form of nervous disease during pregnancy that they never experience at other times. I have one patient who is now pregnant for the third time, and each time she has been attacked with chorea in the latter part of the first month, which has continued until the seventh, and thereafter gradually subsided, until at term the nervous disorder was gone. I could not see that the course of the disease was more than slightly ameliorated by medicine. As a general rule, I think women of great nervous excitability are less so during pregnancy, however, unless some of the diseases which I shall have occasion to speak of in what I shall say on abortion renders her so. The effects of pregnancy *per se* I believe to be to diminish the nervous excitability of women. Coexistent with ulceration of the uterus, great derangement of the digestive organs, etc., the woman becomes nervous as the effect of these diseases, which may be aggravated by pregnancy. Organic diseases of the heart are affected badly by pregnancy, especially during the latter months. They are apt to advance during gestation, and be aggravated more by the occurrence of labor; hence we may regard this as an unfortunate complication. In the hypertrophy resulting from rheumatic endocarditis, I have seen several cases of hydrothorax during gestation that were very troublesome and difficult of management, yielding in fact only after this function terminated.

The course of phthisis pulmonalis is often very decidedly influenced by the supervention of pregnancy. All the symptoms are generally ameliorated to a degree that is sometimes surprising, and occasionally the advance of tissual destruction in the lungs seems to be stayed. This improvement is in most instances only temporary, and after accouchement the march of the symptoms is more rapid, seeming to make up for lost time, and the patient dies in something like the same length of time as if there had been no interruption in the progress of the disease. In rare instances, and I think I have one of this kind under observation now, the woman remains greatly improved, and undoubtedly permanently benefited. Acute inflammations are more intense, run a more rapid course, and are much more dangerous during pregnancy than at other times. Dr. Tyler Smith says this is especially so in inflammation occurring in the organs contained in the thorax, as pneumonia and pleuritis, and that the treatment should be more prompt and energetic to secure favorable results. Acute inflammation of the abdominal viscera, however, is more hazardous to the pregnant woman than that of any other part of the body. General enteritis, peritonitis, hepatitis, and nephritis, are far more dangerous and difficult to manage than when the woman is not pregnant. But dysentery is probably a worse disease when complicated with gestation than any of these. It is especially to be dreaded after the middle period.

Fevers uncomplicated with inflammation are not so likely to be unfavorably influenced by pregnancy as the inflammatory affections, yet much difference is found to attend them in different years and localities. During some years, and the prevalence of epidemics, they are very generally hazardous, while in others the pregnant do not suffer more than other patients. These remarks apply to the eruptive as well as typhoid fevers. The endemic fevers of miasmatic districts, in some years, are very severe upon patients attacked during gestation, but, like other forms, are very much influenced by occult and inappreciable causes to quite a difference in this respect. In the years 1846 and 1847, in one district near the junction of the Wabash and Ohio rivers, I was unfortunate enough to lose all my patients who had remitting bilious fevers complicated with gestation. The fever during those seasons continued uninterruptedly, under what I considered the most judicious management, until abortion or premature labor occurred, when rapid collapse was the sure precursor of death. In other seasons this fatal tendency was not observed.

I might state in this connection that the endemic affections among other classes of patients during these fatal years were much more than ordinarily severe.

General Therapeutics of Pregnancy.—It is a perplexing question with the inexperienced practitioner, whether there should be any modification in the treatment of severe forms of disease because of the co-existence of pregnancy, and, judging from my own observation, a question that exerts a good deal of influence in this respect with all of us. We are quite apt to fall short of the most efficient application of remedies lest their ulterior effects might add to the dangers of the case by inducing abortion, a complication which, aside from the loss of the fœtus, is one of much hazard to the mother, especially in fevers and abdominal inflammations. Gestation renders the nervous system more susceptible to impressions and increases the activity of the vascular apparatus, including the capillary. I am decidedly of the opinion that patients in this condition do not bear stimulant impressions from any cause as well as when not pregnant, and exciting agents frequently produce upon them exaggerated effects. If there is any one general idea in connection with the treatment of acute disease in pregnant woman more important than others, it is the propriety of the more liberal use of arterial and nervous sedatives, and the cautious use of remedies that may increase the excitement of either. I would not be understood to prohibit the use of nerve or vascular stimulants when indicated by diseased conditions, but to inculcate caution in the employment of them. And I think that in the treatment of acute diseases in pregnancy, it is always wise to guard our patients against the effects of powerful therapeutic impressions, when it is necessary to make them, by the conjoint use of soothing means calculated to counteract them, or at least to be ready to apply these last when any indication of the exaggerated effects of the former may appear. In considering this subject at the bedside, however, while we remember the importance of caution in the employment of remedies, we should not lose sight of the fact that in severe cases the employment of energetic measures is no less necessary in these patients than in others. We must carefully consider the certain dangers of the uncontrolled disease, always giving due prominence to the efficiency of the conservative and recuperative powers of the system; measuring deliberately its intensity, the probable consequences of energetic therapeutic impressions, and then act with the decision demanded by the importance of the case.

If the disease is overwhelming in its extent and intensity, we are not justified in omitting the most energetic measures, and the rapid succession of the most powerful therapeutic impressions; if, on the other hand, there is doubt as to the necessity of measures so disturbing in their character, we should trust much to nature. In protracted diseases there are two general evils generated to which our especial attention should be directed as having a peculiarly deleterious effect upon the fœtus: the deterioration of the blood as an oxygen-carrier, and the depression of the nervous energies, which control the organic functions as a consequence, that preside over fœtal development. It is probably not so much that the impoverished blood of fevers is incapable of affording or sparing the material necessary to erect the structures or sustain the nutrition of the fœtus, as the inability to convey—on account of the deterioration of the globules—a sufficient quantity of oxygen. And to insure the patient against this evil I have for a number of years been in the habit of using chlorate of potassa in such patients, where disease has been protracted for a great length of time, with good results, I think, generally mixed with food of an appropriate character, according to the disease and general condition of the patient. Doubtless the peroxide of hydrogen and permanganate of potassa would also be very appropriate, and ozonic ether, where a stimulant of this kind was necessary for immediate purposes. The idea is to supply the circulating mass with as much oxygen as may be conveyed by it. Fresh air in a cool condition, out door and in the sleeping apartments, is of course an indispensable means in connection with other treatment. Nutritious diet of an appropriate kind, with such means as are above mentioned, will do as much toward correcting the "nervousness" of protracted disease as any treatment we can devise. In using particular remedies, or classes of remedies, during pregnancy, we may be governed by the general consideration of avoiding the production of abortion by exciting the uterus to action, inducing congestion in it, or employing means that act deleteriously on the fœtus; and to get a more definite understanding in the matter, I propose to allude in a very brief manner to some of the more prominent agencies likely to be used in the disease of pregnant women. When indicated by the presence of disease, to what extent may depletion be carried? For acute disease we may employ depletory measures that do not produce sudden shocks with great freedom. Venesection is well borne by the pregnant in acute inflammatory affections. But we should not carry this operation so far as to induce syncope, as we might do with propriety in patients not pregnant. One, two, or even three bleedings, to produce a decided impression, may be employed with impunity when demanded by the nature of the disease, and indicated by the condition of nutrition and the blood. There would be danger of rendering the excitability of the nervous system so great as to originate uterine contractions by the effects of syncope, induced one or more times; and if so much blood is lost as to very decidedly impoverish the blood, the fœtus may suffer from it. Local bleedings with leeches and cupping are scarcely objectionable on account of pregnancy. There are several arterial sedatives, now much used to combat inflammatory diseases, either as adjuvants or substitutes for blood-letting, that produce so decided an impression on the nervous system also as to deter many practitioners from resorting to them. Among the vegetable remedies, and at the head of the list, because of its efficiency, is the veratrum viride. This most excellent remedy has obtained the reputation of inducing abortion, but I think without sufficient evidence of a practical character. From special attention to its effects in this respect in over twenty cases, within the last three years, where it was administered as freely as required, and could be borne without reducing the rate of circulation to an improper degree,—say below fifty pulsations to the minute,—I could perceive no deleterious effects from it in this limited number of cases, and abortion certainly did not occur in any of them. Although I have used it freely for years, I do not remember having seen abortion occur in any case in which it was used; hence I should not hesitate to regard it as safe when employed with the usual restrictions. Aconite and gelseminum, so far as I know, have not been objected to as appropriate medicines to be used during pregnancy. They are both efficient, and indicated with the same considerations as if pregnancy did not exist. In sedative doses the antimonials are not at all contra-indicated in this class of patients, but they should be administered in small doses at first, and increased very gradually, lest the irritation of the stomach be great enough to disturb through its sympathies the whole nervous system.

Emetics have been objected to most of almost any class of remedies, and doubtless with some degree of justice; but they are sometimes very useful even in pregnancy, and may be given very properly, when indicated, once or twice during an acute attack. Ipecacuanha and lobelia are probably the safer emetics, while the antimonials and other mineral substances are more likely to do mischief. I have seen the two first-named emetics administered quite frequently in the miasmatic region of the lower Ohio River with apparently no injurious effects, while they completely filled the indications for which they were given. Much caution should be exercised in the selection of cathartics to be used in acute diseases occurring during pregnancy. A drastic impression upon the alimentary canal quite often is propagated to the uterus and bladder. This is especially the case with the influence exerted by aloes. Much more effect is exerted on the uterus by moderate griping from aloes—because it is upon the lower bowels, between which and this organ there is strong sympathy—than much greater irritation by jalap, for instance, because the upper part of the intestinal tract is the locality most affected. But very powerful cathartics should be avoided in pregnancy. Those most reliable and generally sufficient are calomel, magnesia, rhubarb, and the several sulphates of magnesia, soda, etc. But none of these should be repeated in energetic doses very often.

The close sympathy between the bladder and uterus makes the use of irritating diuretics a matter of much solicitude. A little reflection as to effects of the different diuretics will enable us to separate the injurious from the more innocent, and thus to avail ourselves of their benefits without much risk from them. The terebinthinate diuretics, the juniper, savine, cantharides, and some others, in addition to causing an increase of this secretion of urine, very strongly stimulate the mucous membrane lining the whole urinary apparatus, creating an irritation that is apt to be propagated to the uterus, and thus cause abortion. Another, and in fact the more efficient class of diuretics, are the preparations of potassa and soda. The nitrate, tartrate, bitartrate, acetate, and iodide of potash are among our very best diuretics, and have but little irritating effect upon the mucous lining of the kidneys and urinary bladder. They can be employed very freely without apprehension. The great anti-periodic, quinine, has been accused of much mischief among pregnant women. There are many who believe that quinine is very likely to cause abortion when administered freely during pregnancy, but I am constrained to say without sufficient evidence. We often, I think, mistake mere coincidences for cause and effect, and from considerable opportunities for observation I must believe that this is the case with our experience in the administration of quinine. The miasmatic diseases for which we give it are very deleterious to the fœtus itself. The fœtus is known to be affected sometimes with miasmatic fevers, and it often dies before being expelled in those cases. Sometimes it is ejected from the uterus in a state of incipient decomposition, having in all probability been the victim of this poison, and that, too, when quinine could not be accused of even aiding the process. In the earlier years of my practice quinine was given in small doses in remittent bilious fevers, and only in the stage of remission; in the later years of my residence and practice in the same neighborhood, it was used in larger doses and during all stages of the fever. Abortion was a more frequent complication in those earlier years than in the latter, and I think all because of the difference in the mode of administering this remedy. With the small doses the fever ran a comparatively protracted course and exerted a baneful effect upon the fœtus, while with the larger doses the course of the disease was readily interrupted, and its effects upon the fœtus avoided.

For several years I have entertained no apprehension of the injurious effects of quinine during gestation, and have resorted to it as freely as under other circumstances.

Blisters, in diseases occurring during the condition of pregnancy, are very properly used with caution. The vesicatory impression is in itself probably almost innocuous, but the cantharides often causes strangury, and through irritation of the bladder indirectly, very decidedly affects the uterus. When employed, therefore, they should be removed so soon as general redness supervenes, and the remainder of the process of vesication be effected by emollient cataplasms. The parts should be subsequently thoroughly cleansed so as to remove all the oil and the cantharides. Sinapisms or other counter-irritants are very useful and comparatively safe remedies in the pregnant condition. The mercurial alteratives are so often beneficial, and frequently administered, that it is interesting to inquire how far they are admissible during pregnancy. When carried far enough to induce their specific inflammation, mercurials are the cause of anxiety. I am persuaded that the decided impression of mercurials is shown first—or contemporaneous with ptyalism—in the form of inflammation of the mucous membrane of the rectum, attended with severe tenesmus.

If this tenesmus is very severe and protracted, it is quite apt to cause uterine contractions. But if we administer this mineral in small doses, and suspend it so soon as we discover the first evidences of incipient stomatitis, or rectal irritation, we need not entertain doubts as to the propriety of giving it. I do not know that any objections are urged against the iodide of potassium in pregnancy, but believe it is used with freedom.

When necessary to employ and continue the use of perturbating remedies for the relief of the acute diseases incident to pregnant women, anodynes, for the purpose of guarding the system against the possible injurious effects they may have, are invaluable and almost always available. Indeed, when I am treating a patient who is pregnant for acute inflammation, fevers, or other acute diseases, if an anodyne is not indicated, or cannot be simultaneously employed, I direct the nurse to keep one on hand ready for use, and instruct her to administer it upon the commencement of any suspicious pain indicating uterine contractions. If the disease has any tendency to cause abortion, or if the medicines necessary to cure the disease should give rise to any symptoms that might result in the interruption of gestation, this mode of using anodynes would often prevent them.

Opium is undoubtedly the best and most reliable anodyne for this purpose, and should be administered promptly, and sufficiently often to prevent or arrest uterine contractions. It is sometimes the case that we cannot employ opium on account of its peculiar effects upon the patient, or because it is contra-indicated by the nature of the disease; in such instances we can choose between hyoscyamus, camphor, belladonna, and their combinations, administered with the other remedies being used, or kept in reserve to be given only when the symptoms require them. I think it will be found to be the case, however, that by far the most efficacious medicine to control these incipient uterine contractions is opium.

EXTRA-UTERINE PREGNANCY.

This term will be understood to mean the lodgment of the ovum and development of the embryo more or less completely outside of the uterus, in some other of the maternal structures. The ovum may not leave the ovary, but form attachments to that organ or its neighboring structures,—ovarian pregnancy,—or fall or be otherwise displaced from the ovary into the abdominal or pelvic cavities, and, making connections in part or wholly at a distance from the ovary, become abdominal pregnancy; or it is arrested as it commences entering the Fallopian tube, and becomes developed by involving both the ovary and tube in its attachments,—then it is called ovaro-tubal pregnancy; or, lastly, it may be arrested in its transit through the tube toward the uterus, and this variety is named tubal pregnancy. The arrest in the tube occurs at different points in different places; sometimes at the outer extremity, just within the fimbriated termination, midway, or near the uterine end of the tube. When it commences development in that part of the tube which is inside the uterine walls it is called interstitial pregnancy, because in growing it displaces the tissues in such manner as to make a nidus in the substances of the uterine muscular structure. It will be readily understood that as the ovum increases in size, in ovarian pregnancy for instance, and sends its vessels through the chorion membrane, penetrating the tissues surrounding and in contact with it in forming its placental attachments, the ovary will be too small to afford room for expansion and connection to accommodate it, hence at term an original ovarian pregnancy may become abdominal. In fact, the placental attachments can be formed on the ovary to a very small extent only. As the ovum grows it presses upon, displaces, and forms adhesions with many viscera and much of the peritoneal membrane. So much alteration, therefore, in the locality and change in the condition of all the parts take place that it is not strange dispute should have arisen as to many of the circumstances concerning them. Dr. Stephen Rogers, in an excellent paper published in the Transactions of the American Medical Association, does not believe that the ovum can be entirely developed on the peritoneal surface, but that its primary and essential attachments are found in the ovisac or

Fallopian tube, and that abdominal extra-uterine pregnancy is, in fact, ovaro-tubal, with adhesions and vascular attachments to surrounding tissues. It is a matter of the greatest difficulty to unravel all the intricacies of the changes that come to our knowledge in examining cases where development has led to fatal effects, after the long presence of the ovum and violent and repeated inflammation have added to the confusion; and hence difference of opinion is to be expected, and is not of much importance.

Development and growth take place in this unnatural situation very much the same as in utero. The chorion, amnion, and placenta seem to be perfectly formed, and generally recognized without difficulty, and fœtal organization is as rapid and complete as in ordinary pregnancy; this is especially so in the abdominal or tubo-ovarian variety. Much difference of opinion is entertained as to the existence and whereabouts of the decidua. Some investigators believe that this membrane is formed in the uterus with as much uniformity as if the ovum found its way into this cavity, while others think it is not so formed. It would seem easy to determine the facts in reference to this point, but the facts really make the difference. It is hardly probable that men of so much ability as some of these writers would be mistaken; hence it is fair to conclude that while the deciduous membrane is always formed, it is not always found, in the uterine cavity at the post-mortem. One of two cases which I have had an opportunity to examine presented no deciduous membrane in the uterus, and I could not determine whether it surrounded the ovum which escaped from the ruptured tube.

As will be seen by an examination of the symptoms, the fatal catastrophe is often preceded by sanguineous discharges from the vagina, in which it is believed by Dr. Stephens and others that the decidua escapes and is lost. It is held also by some writers on this subject that a decidua is always found enveloping the ovum, while it is stoutly controverted by others. Whether this membrane is absolutely necessary to the full development of the fœtus is involved in this controverted question. We must wait for a solution of both questions. Meantime I cannot doubt that observers have found it in some specimens, while their opponents have failed to meet with it in others. As Dr. Stephens conjectures, it is possible that the whole of the genital cavities, from and including the ovisac to the os uteri, may be possessed with the capacity to form this membrane, while the peritoneal surface has no such endowments. However this may be, the parts immediately surrounding the ovum experience such changes in vascular and other qualities as enable them to accommodate the untoward circumstances. The vessels of the surface to which the placenta attaches are enormously enlarged, and are intertwined with the fœtal tufts, and in the earlier weeks produce an unusual amount of fluid, by which the ovum is surrounded, and sometimes fibrine enough to cause adhesions of more than ordinary firmness, while the viscera are compressed and crowded out of their places, and otherwise suffer from the encroachments of the growing ovum. If the pregnancy is ovaro-tubal, or abdominal, there is no impediment to its development, and in most instances full term is reached without disastrous consequences, or even serious or extraordinary suffering. At the end of gestation, generally, symptoms of labor occur, and after a lapse of some hours or days subside, and perhaps recur; but finally the uterus ceases to be disturbed, the motion of the child is no longer felt, and auscultation detects no signs of life. The enlargement is the only evidence of pregnancy. In some rare instances, after the end of gestation the tumor gradually decreases in size, and subsides toward one of the iliac fossæ, becoming more dense and resistant, and remaining stationary for an uncertain length of time. In fact, a great many years may elapse, and the patient die without any untoward symptom arising from the presence of the fœtus. The whole ovum may become hardened even to almost general ossification, and thus become unimpressible by accidents. At other times, soon after the spurious labor has passed by, and the death of the fœtus has transpired, it is felt by the peritoneal cavity as a foreign body, inflammation is lighted up, generally of a moderate grade, in the tissues surrounding the ovum, disintegration begins in this foreign mass, the fœtus is dismembered by a process of putrefaction, and in one great abscess the whole is eliminated piecemeal, one bone succeeding another, hair, skin, and putrefying muscles finding their way out, until through months of toxæmia, with its distressing symptoms, the patient emerges into good health again. At other times, months and even years after the cessation of the signs of fœtal life elapses, and only as a consequence of some accident giving origin to inflammation, the above series of circumstances are initiated. I knew an instance in which the woman had borne and given birth to two children with the dead one in the abdomen, and after the third labor destructive inflammation led to the discharge of it. Rarely the death of the fœtus is followed by acute inflammation that leads to a fatal issue in the mother. Long-continued inflammation, very frequently occurring in the attempt to eliminate the fœtus, with its exhausting consequences, undermines the vital forces or lead to some cachectic developments that causes the death of the patient.

The tubal variety pursues quite a different course. In the early weeks there is no reason to suspect the nature of the pregnancy, but in the second month the patient is generally attacked with pains resembling uterine contractions; but as they are referred to one or the other iliac region they are regarded as colicky pains, and as they cease and recur every day, or every few days, the suspicion is confirmed in the opinion of the patient and friends. At the end of the second or during the third, and, in some rare instances, the fourth month, these pains become very severe, and in one of the paroxysms the patient is seized with faintness, she becomes cold, the pulse increases in rapidity and is small and weak, and the patient quite rapidly sinks into a state of collapse, and in twelve, twenty-four hours, or two or more days, dies. During the time of these colicky pains there is apt to be a muco-sanguineous discharge from the uterus, sometimes a large amount, sometimes a small quantity, and occasionally none. The autopsy shows an enlargement of the tube, at some particular place in its length, that has been ruptured by over-distention and blood-vessels torn, from which a copious effusion of blood has filled the peritoneal cavity and caused fatal syncope.

In some very rare instances the algid symptoms give place to reaction, and fatal peritonitis results; or the peritonitis is less severe and subsides, leaving the ovum in the abdominal cavity, harmless perhaps during the whole future life of the woman, or subject to the same sort of accidental elimination as the abdominal variety. This difference in the termination of the prostration that succeeds rupture of the tube depends upon the locality of the rent. If it occurs in a part of the tube where the vessels are small and soon cease to bleed, the collapse will soon give place to moderate reaction; but if the tube is torn at a point where the placenta is attached, larger vessels will be sundered and a fatal amount of blood lost. I think we may account for the difference in the time when rupture occurs by remembering that the capacity of the tube is much greater at the ovarian extremity than at the uterine end, and supposing that an ovum would grow to a greater size in that end than if it had passed the middle and entered the narrow part near the uterus.

Causes.—The cause or causes of extra-uterine gestation are not definitely known. Any circumstance that arrests or retards the progress of the ovum in its transit from the ovary to the uterus would cause this accident; an indurated or deformed state of the fimbria of the ovarian end of the tube would prevent the ovum from entering it. Constriction of the tube by false membranes, caused by the fibrinous effusion of peritonitis, narrowing by tumefaction, or anything that would disqualify it to afford safe and easy passage to the ovum; or, on the part of the ovum, rapid increase of size, enlarging of it beyond the capacity of the tube. Extra-uterine gestation, compared to the vast numbers of pregnancies, is quite uncommon; yet there are but few men of many years' practice that have not met with several instances, and doubtless other cases pass unnoticed and misunderstood under the eye of many of us. The tubal variety is much more frequent than the abdominal or ovaro-tubal. I am not in possession of statistics that will enable me to be any more definite on either of these points.

Prognosis.—The prognosis in extra-uterine gestation is very grave, but is widely different in the different varieties. In the abdominal variety the nine months of gestation are not attended with dangers at all equal to the tubal variety. The patients, nearly all of them, live to the end of the term, when their greatest danger begins, and there are but very few of them but what enter upon a life of precarious existence, and about all are the subjects of very serious disease, and many of them die after being invalids for a very long time. The tubal variety is almost uniformly fatal. It terminates in sudden and overwhelming collapse that proves to be the certain prelude to death.

Diagnosis.—If the suspicions of the practitioner are aroused the diagnosis is generally possible, and the reason why the condition of the patient is not better understood before the disastrous termination is reached, is because the attention is not called to the possibility of extra-uterine gestation. The symptoms are those of ordinary pregnancy,—at first, suppression of the menses, enlargement of the uterus, changes in the breasts, nausea, etc., etc. In the abdominal and ovaro-tubal varieties the tumor arises out of the pelvis earlier than in ordinary pregnancy, is situated more on one side, generally less movable than the pregnant uterus, more globular, the uterus being pyriform; the motions and irregularities of the fœtal extremities and head are greatly more distinct, and auscultation far more easy and satisfactory. Examining per vaginam, the uterus does not increase very much in size, and if probed will show its outlines not in connection with the tumor. This last is felt to sink lower in the pelvis on one side than the other, but not to occupy that cavity as completely as the gravid uterus at any time. It is not usually possible to perform ballottement satisfactorily. After the death of the fœtus the diagnosis becomes more difficult, and we must rely upon the history to a great extent. If the urgency of the symptoms or other reason demands accuracy, the exploring needle introduced into the tumor will evacuate some of the characteristic fluids contained in it. The diagnosis of this variety is the more certain the farther the pregnancy is advanced. The diagnosis of the tubal variety is very difficult until the occurrence of the terminal accident. The pains recur frequently in paroxysms on one side of the pelvis, always in the same position, commencing generally about six weeks after the date of conception, and without obvious reasons returning, each paroxysm becoming worse, and often attended with muco-sanguineous discharge from the vagina—this discharge, when placed under a microscope, showing deciduous membrane. While these symptoms are suspicious they are not conclusive, as they may be simulated by early abortion. They aid us very materially, however, in comprehending the state of things when succeeded by collapse. The collapse following rupture of the Fallopian tube is sudden, and not attended with an amount of discharge of any kind sufficient to explain the occurrence of the symptoms. If, however, after a careful consideration of the history of the case and the symptoms, we are at a loss to determine definitely what is the cause of the symptoms, I should unhesitatingly second the suggestion made by Dr. Stephens, to penetrate the abdomen with an exploring trochar. And if a sero-sanious discharge flowed freely through the canula I should regard the diagnosis complete.

Treatment.—Should the abdominal variety be recognized during the course of gestation, an effort should be made to arrest the growth of the fœtus by strong shocks of electro-magnetism, and the efficiency of it may be increased by acupuncturation, using the needles as the medium for the current, which may thus be concentrated upon some particular part; or, like Dr. Greenhalgh of St. Bartholomew, if the tumor is within reach of the vagina, draw off the liquor amnii from the ovum and thus cause the embryo to perish. If the condition is not perfectly understood until the end of term, and the fœtus is still living, I would advise gastrotomy for its removal, hoping to save its life, and give the mother a fair chance for recovery. I should feel that this operation was, upon the whole, the most promising to the two individuals. The operation would differ scarcely at all from gastro-hysterotomy, except in the management of the placenta and membranes. In this case, if the placenta did not separate from its connections by the exercise of such force as may be exerted through gentle traction on the cord, it would be advisable to tie a strong silk thread to the funis, very near the placenta, and allow it to hang out of the wound and remove the rest of the cord. Traction should be repeatedly, but gently, made, so as not to break the connection between the cord and placenta until this organ present itself at the wound, when the latter may be reopened sufficiently to permit its passage. The wound may be closed with pins and interrupted sutures. This management of the placenta is better than an attempt to separate and deliver it at once, because the force necessary to do so might rupture vessels that would cause damaging if not dangerous hemorrhage; but if the placenta remain some hours, or even a day or two, the vessels become empty, and disintegration begins in the extremely attenuated connective tissues that cement the vascular system of the mother and fœtus, and thus permit of easy and bloodless separation. For the subsequent treatment, as well as description of gastrotomy, I must refer to that operation.

Perhaps the greater number of these cases of extra-uterine abdominal pregnancies are not recognized by the attendants until after the futile efforts at expulsion and death of the fœtus have transpired. The treatment will of course be modified again by these circumstances. The salvation of the child is impossible, and its welfare of no consequence, the mother's comfort being of more importance, and her life everything; and inasmuch as nature often adopts measures that reduce the difficulties to mere inconveniences, we should await her further steps, bearing in mind that inflammation in some form, either active and suddenly destructive, or suppurative and eliminative, is the most common danger, and that our duties are primarily to moderate the one and modify the other form, so that our patient may be sustained through her protracted and exhausting trials. When parts of the fœtus which are detached present themselves in suppurating cavities we may remove them with forceps, with or without enlargement of the opening. But I am not clear that it would be advisable to perform gastrotomy, in the proper sense of the term, for the entire removal of the fœtus. I would rather wait the more tedious method instituted by nature, following instead of preceding her.

As the fœtus is liquefied by decomposition in the processes by which it is prepared for removal by suppuration, another danger presents itself, viz., toxæmia. Absorption of this material sometimes takes place, the circulating fluid is contaminated by it, and toxæmic fever, with its colliquative diarrhœa and perspirations, exhausts the patient. The sulphites internally, and the carbolic acid locally, may often enable us to carry our patient through these difficulties.

In the tubal and interstitial pregnancy the invariable tendency is to rupture of the cyst in which the ovum is contained, and fatal extravasation of blood into the peritoneal cavity, and in less frequent instances in the ovaro-tubal and abdominal pregnancy. In any or all of these cases the danger is fatal hemorrhage, and the object to arrest it. While the symptoms, to a *careful and thoroughly informed* observer, *might* lead to a detection of the presence of tubal or others of these forms of extra-uterine pregnancy, they are not sufficiently distinctive to arrest the attention of the ordinary practitioner, nor upon which to base any very decided measures of relief.

There is at least one instance on record, by Heim, of Berlin, where gastrotomy was performed for the removal of a supposed extra-uterine fœtus, but no fœtal or other tumor was found. But matters assume an entirely different aspect when rupture of the cyst has taken place. The hemorrhage has begun and is evidenced by symptoms that at once render the condition of things unmistakable and interference imperative. The conscientious practitioner cannot hesitate to meet desperate symptoms with the most energetic and radical measures furnished him by the profession. There seems to be no hope from palliative means or medicinal remedies. Surgery is our only means of expectation. I agree with Dr. Stephens and some others, that the bleeding vessels must be ligated early as possible. The patient should be kept as quiet as possible, with head low, especially if symptoms of syncope have begun to show themselves, and ice placed upon the hypogastrium, and immediate preparations made to open the abdomen. The abdominal section may be made in the median line, about three inches in length, commencing three inches above the pubic bone. This opening will enable us to examine both ovarian regions easily. When the ruptured cyst is found, its base should be surrounded by a double ligature firmly tied, and the whole cyst removed. The blood should be carefully and thoroughly removed by very fine sponges, and if the whole ovum is not contained in the cyst already taken out, search should be made for it. Everything that could cause injury being removed from the abdominal cavity, the external wound should be closed, and one end of the ligature, by which the tumor was surrounded, be allowed to hang out of the lower angle. The subsequent treatment of the patient will be governed by the general principles applicable to all cases of peritoneal section.

As the patient is almost always very much exhausted from loss of blood, stimulants, quiet, and external warmth, followed by nutrition, will be the first and initiatory items in the case after the operation. I am not disposed to argue the propriety of this operation to any extent. The diagnosis being complete, the question seems to me to be between inevitable death and a possibility of relief. I may say, however, that the dangers of peritoneal operations are very much less now than they used to be, and that they never were so great as they were—until within the last ten years—thought to be.

Extra-Ventral Pregnancy is among the recorded possibilities of the aberrations of this function. Several cases have been observed, and described by writers, of hernial pregnancy. The ovary and fimbriated extremity of one of the Fallopian tubes having found their way out of the inguinal ring on one side, the ovum is arrested between them and is then developed, partly or wholly. Müller relates a case where a fœtus was carried to the full term of pregnancy in, and removed alive from, an inguinal sac entirely outside the abdominal cavity. Other instances less remarkable have been witnessed;—one by Dr. Genth, of Germany, given by Dr. Stephens at some length in the paper above mentioned. It was furnished him by Drs. Herschell and Blumenthal, of New York City. The ovum had grown from four to five months, when, on account of its painfulness and the effect it had upon the general health of the patient, the contents of the tumor were removed. The fœtus was living, but not viable. The diagnosis was not made in this case prior to the operation. One would think that the diagnosis of this condition would not be difficult, and certainly after motion was evident there could be no excuse for error but negligence. When we meet with such cases as these, our endeavor should be to preserve the child in its adventitious lodgings until viable, and then remove it by excision. If this be not compatible with the life of the child, the tumor may be opened earlier. The great dangers are hemorrhage, upon separation of the placenta, and inflammation. In the case given by Dr. Müller, the patient died of hemorrhage, apparently internal.

Missed Labor.—Another grave error in the process of generation is called very properly missed labor. Gestation is completed to the perfect development of the ovum, ready for expulsion, with a fœtus capable of independent life, but the uterus fails to expel it. Probably no uterine efforts are made, or if contractions occur they are not sufficient, and subside without any useful result.

The fœtus dies, and a series of consequences are originated calculated to dispose of it in some other way. After a number of days or weeks, inflammation of sufficient extent and grade may be set up to produce fatal effects in a short time. Or the decomposition of the fœtus may afford putrilage enough to poison the blood by absorption, and after a longer or shorter course of toxæmic fever exhaust the patient. Or again, after undergoing adipocerous maceration, the fœtus may be dismembered and the small parts find their way through the os uteri, piecemeal, until the whole of it is expelled. Another mode of termination is caused by local inflammation in the uterus, followed by suppuration and the formation of one or more abscesses, and discharge of the bones and other tissues of the fœtus from them.

This process, of course, would be attended with the exhausting effects of hectic fever, which may be sufficient to overwhelm the patient, or at least produce a great amount of suffering. But still another disposition is made of the contents of the uterus in some instances. After term is passed, the fœtus ceases to exhibit signs of life, the tumor commences diminishing in size slowly, and becoming harder. After a long time the tumor is very much smaller, very dense and compact, and thus remains for many years, and, if the patient lives to be very old, may be found ossified. A case of this kind is mentioned by Dr. A. R. Gardner, in his American edition of Dr. Tyler Smith's Lectures on Midwifery. Dr. Oldham reported a case of missed labor to the London Pathological Society, in 1848. Mention of this case may be found in the same work.

Diagnosis.—An investigation of the uterus by manual examination, the introduction of the sound if necessary, and the history of the case, ought to lead to a proper diagnosis.

The evacuation of the uterus can be effected with a good deal of certainty by dilating the mouth with compressed sponge or Barnes' dilators, evacuating the liquor amnii, and giving ergot, when the difficulties are overcome and our patient falls into the category of the common lying-in.

MOLE PREGNANCY—BLIGHTED OVA.

We occasionally meet with organized substances discharged from the uterus, of diverse formations, fleshy in their character, that have not the characteristics of any part of the ovum to a perfect degree, and yet enough similarity to the structure of the placenta to plainly refer to it as their origin. Among the people these products are regarded as the effect of false conception, that is, that they are originally imperfect in their formation; but it is quite certain, from all the facts in our possession, that the pregnancy in the beginning is normal, and that from some form of accident a change in development occurs in which the growth of the fœtus is arrested, while the placenta and membranes continue to grow. But they not only continue to grow, but they are developed in an abnormal manner. In one variety the placenta becomes more solid, loses much of its vascularity, and instead of being spongy it is carnified, and actually loses the vascularity attributable to the presence of fœtal tufts of veins and arteries. The fœtus in this form is either entirely lost, dissolved, and disintegrated in the liquor amnii, or escapes, or very diminutive in size compared to the time of gestation. In this form of indurated placenta this organ does not enlarge in proportion to the period of pregnancy, and the woman is not large as usual for her time. This is the form of placental degeneration to which the term mole is applied; and the arrest of fœtal development and change in the structure of the placenta begins early in pregnancy, as early, often, as the latter part of the second month, and the mole may not be expelled for two or even three months, or even more. But arrest of fœtal growth takes place also at a later period of gestation, even after the commencement of the sixth month. In the later months the placenta has acquired greater perfection in its structure, and its nature is more obvious; but a similar process of carnification goes on, and if the ovum is retained some weeks, or, as it sometimes is, months, the vascularity and peculiar tissue of the placenta is lost, and there only remains enough to keep up a very imperfect sort of vitality and prevent decomposition. After the ovum is thus blighted, it does not increase in size; the woman, in fact, rather grows less until the contents of the uterus are discharged.

But the ovum degenerates in still another form—Hydatidiform. Instead of becoming more solid and condensed, or carnified, the degeneration of the placenta gives origin to a large number of bulbs, sacs, or vesicles, of different sizes, containing a transparent serous fluid. These vesicles are called hydatids. They grow in large numbers, are adherent to each other by a contracted cervix or neck, collected in clusters, and are of quite diverse shapes—globular, oblong, oval, cylindrical, and irregular. They ordinarily are the product of early degeneration,—that is, the arrest of growth in the fœtus takes place early, probably more frequently in the second or early part of the third month; they grow quite rapidly, so that a woman in the fourth month is as large as if six months pregnant. If one of these degenerate placentæ be examined closely, there will be found in the central parts something of solid substance, more carneous than a natural placenta; there is nothing of the peculiar spongy tissues produced by a normal condition of the fœtal vessels, and the farther from the centre, the more numerous and larger the vesicles become. It is believed generally now that these vesicles are the hypertrophied villi of the chorion—this portion of the ovum outgrowing the other tissues. However this may be, the hydatidiform cysts become very numerous and form a mass of great bulk, sometimes amounting to several quarts. All the cases I have met with had attained a large size and quantity in the sixth month, and these abnormal products were expelled before the end of the sixth month. Whether this corresponds with the observations of others I do not know; but in my experience the sixth month generally proves to be the last month of a hydatidiform pregnancy.

Diagnosis.—In many cases of blighted ova a clear diagnosis prior to expulsion is difficult, and sometimes impossible; this remark applies especially to the mole form. The normal signs of pregnancy are present in all instances in the early weeks, such as nausea, suppression of menses, sympathetic manifestation in the mammæ, and these may continue during the entire continuance of the pregnancy; but ordinarily some unusual phenomena appear—occasional discharges of blood from the vagina, with pain in the region of the uterus, back, etc. In the carnified placenta of the early months these symptoms ordinarily persist until expulsion is effected. In cases where the ovum is blighted in the latter months of pregnancy, the normal signs of pregnancy are apt in fact to disappear. If there has been motion it ceases; nausea subsides, if there is any; the breasts, from being full and plump, become flabby, and the fluid disappears, sometimes weeks, and even months, before the ovum is expelled. The symptoms in connection with the hydatidiform degeneration of the placenta are more marked, ordinarily. The ordinary symptoms of pregnancy do not disappear, but continue to an ordinary degree, and of an ordinary character, with the difference that the abdomen grows more rapidly than in ordinary pregnancy. The uterus is more globular in shape and softer in consistence, no motion is felt, and no sounds upon auscultation; no ballottement possible, notwithstanding the great size. There are also, at intervals of uncertain periods, discharges of blood and serum; often a small amount of watery discharge without blood, or at most a mere stain, and not unfrequently a close examination of the discharges enables us to discover the hydatid in them. The probability is that this serous substance is derived from the rupture of one or more of these vesicles.

After expulsion we can generally satisfy ourselves, by inspecting the substances discharged, as to the correctness of our diagnosis. The unimpregnated often discharge solid substances from the uterus that have been frequently mistaken for moles or blighted ova, but they may be easily distinguished from them. The substances not polypoid discharged from the unimpregnated uterus are small, seldom weighing more than one or two drachms, while moles weigh as many ounces. In moles there are always vessels running through some part of it, while in substances coming from the unimpregnated uterus there is no vascularity. The unimpregnated substances are, first, carnified clots of blood moulded to the size and shape of the undeveloped uterine cavity; or, secondly, the exfoliated mucous membrane during dysmenorrhœa, or even occasionally in the common menstrual discharge. Few practitioners of much experience but have seen both of these sorts of uterine moulds.

Prognosis.—Although troublesome, these blighted ova are generally thrown off spontaneously. Sometimes they remain only a few days—generally only a few weeks—sometimes many months. I saw an instance that, so far as I could get the history from my intelligent patient, must have been retained sixteen months from the time of conception, the fœtus having died very soon after quickening took place, or in about four and a half months. Hemorrhage is apt to be the worst circumstance connected with this condition of pregnancy. In the hydatidiform variety I think this is especially the case. In all that I have seen there was decided hemorrhage, and in some this symptom proceeded to an alarming degree. I was called but a few weeks ago, in consultation, to see a patient who was very much prostrated by the bleeding, that had been going on for four weeks, on account of the presence of hydatids in the uterus, and who was soon relieved after the expulsion of a large quantity of these cysts connected with the degenerate placenta.

Treatment.—The great object in the treatment of blighted ova is to cause their expulsion as expeditiously and with as little damage as possible. The first item of this process consists, of course, in the dilatation of the cervix and os uteri, and the second to cause contraction. As the first always requires some violence, and consequently is likely to be followed with some damage, something more than the existence of this condition of pregnancy is necessary to justify it. If there is no disagreeable symptom, we should give nature an opportunity to effect the expulsion of the contents of the uterus unaided. But if the hemorrhage especially is alarming, we should introduce a piece of compressed sponge into the mouth of the uterus, and, after it has expanded well, if there is not sufficient dilatation, we may use a larger one; and when the os uteri is sufficiently open administer ergot, or what is almost, and in some instances more effective, is to break up the attachments of the ovum with the finger or small placenta forceps, and remove a portion or the whole of it. An evacuation of the liquor ovi, or a separation of some of the hydatids, initiates uterine contraction, when the influence of ergot will be sufficient to complete the evacuation if it does not take place spontaneously.

DISPLACEMENTS OF THE UTERUS DURING PREGNANCY.

Under extraordinary circumstances the uterus is liable to become so much displaced during pregnancy as to be the cause of much suffering and sometimes death. The most common displacements are retroversion and prolapse.

Prolapse does not often occur as a serious difficulty in pregnancy in cases where it did not exist before that condition supervened. The state of the organs favoring prolapse in the unimpregnated woman is sometimes so changed during pregnancy as to entirely cure the misplacement. But in other instances the prolapse is very much worse, and gives the patient much more inconvenience. Prolapse in pregnancy is met with in various degrees. In some slighter forms the uterus remains low in the pelvis, touching the perinæum longer than usual, and rises only when the uterus becomes very large; at other times the cervix protrudes somewhat from between the labia when the patient is on foot, receding and disappearing at night as the recumbent posture is assumed, and rarely the organ protrudes many inches, forming a tumor large as a man's fist; and in still rarer instances the whole organ hangs down *en masse* outside the vaginal fissure.

As pregnancy advances generally to the latter months the uterus and its contents become too voluminous to remain so low, and it is kept up above the pelvis mostly until labor is over. In extreme cases, where the pelvis is so large and the external organs sufficiently lax as to permit the escape of the uterus in the last weeks of gestation, when labor comes on the organ recedes during this process and assumes its natural relations to the rest of the viscera. Yet there are exceptions to this rule, and the uterus remains outside in part or wholly, and the child is born so soon as it passes the os uteri. I once saw a case where the child had passed entirely through the pelvis while in utero, and I had ocular evidence of its being expelled from the uterine cavity after it had escaped from the body of its mother.

Treatment.—Occurring in the early months of pregnancy it may be treated in much the same manner as prolapse in the unimpregnated, with supporters or bandages that keep the organ within the vulva. An elastic supporter, with straps over the shoulders and down between the thighs, fastened together like suspenders before and behind, will generally keep the uterus from protruding; or, sometimes, a T bandage will answer the same purpose. As the uterus becomes heavier it will be difficult to sustain in this way, if the pelvis is large enough to permit its escape, and the patient will be under the necessity, in some extreme cases, of remaining in the recumbent posture for some weeks before labor—at least a part of the time, and perhaps all the day. In retaining the uterus in position in the sixth month and afterwards by an external apparatus, it should be remembered that the weight is so considerable as sometimes to cause the organ to sustain damage from the necessary pressure, and that it is better to have the patient lie most of her time. If labor begins with the uterus protruded, the protrusion should be corrected before the mouth is dilated, and the organ kept in position by pressure with the hand, and keeping the patient in the recumbent position until expulsion is effected. I do not think, however, that any considerable amount of pressure should be employed, as there can be no danger to either mother or child if the os uteri is not entirely within the cavity of the pelvis, or even inside the labia. We should see that the uterus assumes its proper place, however, after its contents are evacuated, and that it remains there without again prolapsing, as in thus keeping it in the natural relations for some weeks the tendency to prolapse may not again occur.

Retroversion and Retroflexion of the Impregnated Uterus.—In a state of retroversion the fundus uteri lies in the hollow of the sacrum, and the cervix and os uteri are turned upward at or near the symphysis pubis. The same position is occupied by the fundus in retroflexion, while the cervix is so curved as to present the os looking downward behind the symphysis instead of upward, as in retroversion. There can be no doubt but that in many instances retroversion, and retroflexion also, result from a continuance of the misplacement that existed prior to impregnation, as there are certainly cases in which pregnancy finds the uterus in this malposition and causes its development without changing its position. I have also no doubt, from actual observation, that the antecedent retroversion is corrected by the changes that are brought about by gestation. I had an opportunity recently of watching a case of this kind, in which, upon examination several times during the second and third months, I found the uterus strongly retroverted. During the latter part of the third month the fundus commenced to ascend, and by the middle of the fourth month was in its normal position. We may, therefore, and do practically, find the uterus thus misplaced any time

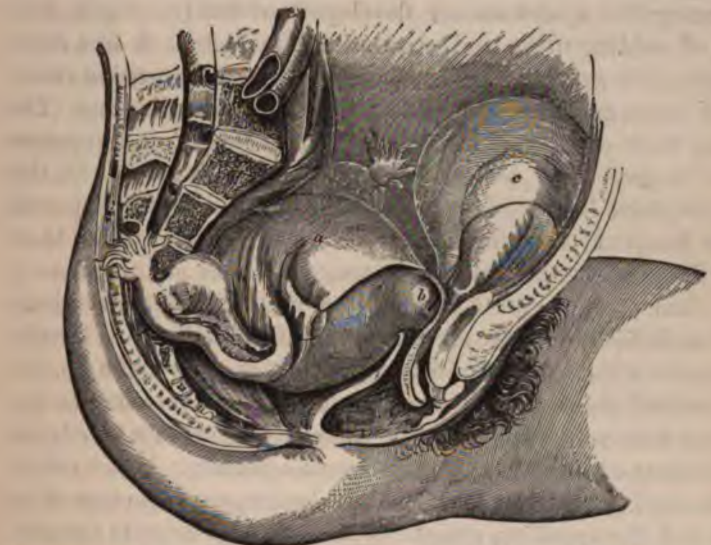


Fig. 81—Shows the Impregnated Uterus Retroverted.—*a.* The Uterus. *b.* The Cervix. *c.* The Urinary Bladder.

from conception to the end of the fourth month, and in extreme exceptional instances up to the end of gestation. But sometimes the organ is suddenly misplaced by being overridden and pressed down by a largely distended bladder, tumors of the abdomen, accumulation of fæces, etc.; and there is no doubt but by the pressure of superincumbent viscera, from the lifting of heavy weights, the tenesmus of dysentery, or severe straining in dysuria.

Symptoms.—When retroversion exists from the beginning of pregnancy the symptoms are developed gradually,—slight difficulty of voiding urine and evacuating the rectum is first experienced; this gradually increases until there is distressing retention of urine, and it becomes almost impracticable to defecate. The patient then complains of great weight in the pelvis, a constant desire to pass water, and frequent disposition to stool. At this time the urine is very likely to dribble away in drops, or be passed by the teaspoonful, while there is great accumulation in the bladder; the pulse becomes quick, the tongue dry, the mouth clammy, and often there is great heat of the parts and general febrile reaction indicating the supervention of inflammation. If the displacement is the result of pressure suddenly applied to the fundus, as described above, these symptoms come on suddenly and assume at once distressing severity—the patient passing in a few hours from a state of comfort to one of intense suffering. If not relieved, the continued distention of the bladder may cause rupture of its coats and the appalling symptoms of effusion of urine in the peritoneal cavity, or the uterus may be ruptured, and its contents escape into the abdomen, or be forced through the posterior wall of the vagina and thus expelled. Or again, inflammation may be set up in the uterus and bladder, and even other parts, leading to fatal results more slowly but not less surely. Nature is sometimes competent to the relief of the patient, even after all the symptoms have become severe and perfectly established, by causing rupture of the membranes and discharge of the whole of the contents of the uterus through the os tincæ, and even by rectifying the malposition without thus causing abortion.

Diagnosis.—By examining the abdomen externally we may find the well-defined, soft, and fluctuating tumor, reaching perhaps to the umbilicus, formed of the distended bladder. In order to further the examination of the hypogastric region, the catheter should be introduced and the bladder evacuated. We may then ascertain the absence of the fundus from that region. The finger introduced into the vagina comes immediately in contact with an elastic tumor that almost fills up the pelvic cavity. This last remark is true only when the uterus is large enough to cause the distressing symptoms of retroflexion. The tumor is in the hollow of the sacrum, and will permit the introduction of the finger only to a slight extent. The boundaries of this tumor should be followed by the fingers toward the symphysis, and ordinarily they will easily pass up behind the symphysis, where the os and cervix will be distinguishable. If the obscurity of the case demands more thorough examination, the forefinger of the right hand may be passed into the rectum high up, while a bent uterine sound or male catheter may be introduced into the bladder and carried over the uterus until the two meet above it. This would exclude the possibility of mistaking the case, as this diagnostic manœuvre could not be executed if the uterus was in its natural place, while it is not difficult of accomplishment under the present described circumstances.

The *prognosis* of retroversion of the impregnated uterus with impaction, as above described, while it is not desperate, is very grave. This is especially the case if not judiciously treated. As will be gathered by the student, the retroflexion or retroversion is not all the evil, and, up to a certain time, is not a very serious matter. It is only after the uterus has become *impacted* in the pelvis, so as to fill it up and check the excretory action of the bladder and rectum, that danger is to be apprehended. I think, properly managed, very few of these cases would terminate otherwise than favorably.

Treatment.—As already stated, there is a tendency to spontaneous cure in many cases, especially when it occurs in the earlier months, so that it is often only necessary to place the patient under the most favorable circumstances, of which the keeping the bladder and rectum empty as nearly as possible, and constantly, is of great importance. It can be easily understood what a great obstacle to the elevation of the uterus in a state of retroversion are a full bladder and an impacted rectum. The bladder, containing from one to four pounds of urine, overriding it from above and in front, is sufficient to cause and keep it in this malposition; while the rectum and sigmoid flexure of the colon, filled to impaction with a mass of hardened unyielding fæces also lying on and against the fundus from above and behind, form an impassable barrier to its rise. It will often be quite sufficient to allow a flexible catheter to remain in the bladder, empty the intestines with saline cathartics and injections with the long rectum tube, and maintain them in this condition, and keep the patient on the left side, with left arm behind, so as to turn the thorax forward, while the right leg lies over in front. These expedients will doubtless enable the uterus to rectify its position if it has not grown so large as to too closely fill up the pelvis, or become impacted. When this last is the case, it will be necessary to use force to dislodge it. Before, however, resorting to force, all the above conditions must be complied with, *i. e.*, the bladder must be emptied, the rectum and sigmoid flexure of the colon cleared of all the fæces, and the patient placed on the left side as above directed, or on her knees and elbows. Two or three of the fingers of the right hand should be introduced into the vagina, and the fundus pressed steadily upward. The force should be applied to the fundus near the sacrum, and the organ elevated to the full length of the fingers; generally this will suffice to reduce the uterus to its proper position. If it does not, the colpeurynter, uninflated, must be pressed up the vagina with the fingers until they can reach no farther, and then inflated while it is steadily pushed upward. The additional elevation thus secured will seldom fail of success. If, however, the organ is so impacted that it will not be dislodged in this way, a very effective method is to introduce the head of a drumstick or an ivory-headed cane into the rectum, and by means of it raise the fundus above the promontory of the sacrum. When the uterus is thus freed from the hollow of the sacrum it starts up and assumes its natural relations. If reduction is impossible by any of these means, abortion should be induced. After the liquor amnii has been drawn off, the uterus is so lessened in size that this process is not difficult. Generally the mouth of the uterus may be reached and the membranes ruptured by a bent probe, but sometimes this is impossible. When this is the case the uterus should be punctured, as near the mouth as practicable, with an exploring trochar, and the liquor amnii allowed to drain off through the canula. If the puncture is made below the junction of the vagina to the cervix, and with the smallest trochar through which the water will flow, there will be absolutely no danger from the operation, and the parts will be left in as good condition as if the waters had been evacuated through the os uteri itself. If we succeed in reducing the uterus, the patient should be kept quiet for a few days; and should it be necessary to induce abortion, much care must be exercised to prevent evil from this circumstance.

ABORTION—MISCARRIAGE.

Pregnancy is very frequently arrested and brought to a termination before term. When this is the case before the fœtus is viable, the accident is denominated miscarriage; but if not until the child is capable of independent existence, it is called premature labor. In this last instance there is so entire a resemblance to ordinary labor that it is not necessary to describe it separately.

It is very important that our knowledge of abortion should be complete and exact, as it is of very frequent occurrence, and a great amount of suffering is entailed upon womankind by it, in addition to the terrible loss of life involved in the death of the numerous embryo human creatures. I shall not attempt an elaborate classification of the different circumstances under which abortion occurs, but will confine myself to the more obvious methods of division, with the hope that I can include everything practicable under them. Violence, accidentally applied or intentionally used, is a common cause of abortion. Falls, blows, shocks, jolts, etc., all intelligibly effect the necessary disturbance in the functions of gestation. This method of applying violence acts indirectly upon the uterus through the general nervous system, or more directly upon the irritability of its own nerve structure. But violence is sometimes applied directly to the organ in such manner as to destroy the integrity of the ovum or injure the textures of the uterus. These effects are brought about by the intentional introduction of probes, quills, syringes, etc., or some larger substances. Accidentally, also, substances find their way into the vagina and lacerate the parts, or bruise them to such a degree as to cause abortion. When these causes are energetic there is but little likelihood of failing in their damage. In contradistinction to the other causes which I shall proceed to consider, these may be termed external causes. These causes are sometimes the exciting causes of miscarriage; when predisposing conditions of the system generally, or of the generative system particularly, render their action more easy and sure, and when, in fact, they would not be sufficiently energetic in themselves to produce the effect, they are then considered exciting causes, while the others are regarded as the predisposing. These predisposing causes, predisposing conditions, or what else we may call them, are, however, in some instances sufficient to accomplish the result without the intervention of the external or exciting cause. It will be convenient, in order to get a more complete view of the subject, to consider these causes as they are manifested in the vascular, nervous, or nutritive function. Instead of the term nutritive function, it would do almost as well to use the word hematosis, as they operate on the nutritive function through the blood.

General congestion, or inflammation of the uterus and appendages, of an acute or chronic grade, is also apt to give rise to abortion during some time in pregnancy. Dr. Bennet, in his work on diseases of the uterus, has pointed out this danger in a very intelligent manner; and Dr. Whitehead, of Manchester, has illustrated by a number of cases the mischief caused by these conditions during pregnancy. Whether chronic inflammations are attended with ulceration, or whatever their situation, either in the cervix or body of the uterus, they frequently cause abortions.

Whether there is such a thing as a purely irritable uterus, without the coincidence of any other element of disease, I will not stop to inquire; but I am free to admit that conditions of the organ do occur in which it is much more susceptible to the deleterious influence of accidental or other exciting causes, and might with propriety be called a nervous or excitable uterus, or, what is not unfrequently the case, it partakes of the general excitable state of the system, and hence is easily affected instead of being especially so. In either of these conditions slight exciting causes awaken contractile efforts that may continue until abortion is inevitable. Under such circumstances the uterus is quite impressible to another class of causes, which operate through the nervous system, and may be termed reflex causes. By this expression I mean the effects produced upon the uterus by impressions made upon parts or organs more or less remote, with which it is connected by the reflex centres in the spinal system. A strong impression made upon the rectum, urethra, bladder, or stomach, is reflected upon the nerves of the uterus, causing great excitement.

Another, and perhaps somewhat different influence, exerted upon the uterus by impressions made upon a distant organ, is the well-known effect caused by irritation of the mammæ.

Various conditions of the blood, among which one of the most frequent is chloro-anæmia. In this condition the nutritive capacity of the system is very low, and the ovum perishes for want of a good condition of the maternal blood, and becomes a foreign substance in the uterus. Plethora, although enumerated in the list of conditions causing abortion, when not attended by any other and more potent etiological circumstance, I think can have but little effect. When combined with local diseases of the genital organs it co-operates efficiently with them. Its effects are, hemorrhage from the uterus, and congestion of the placental circulation, and consequent destruction of the ovum.

Some form of toxæmia is, however, a much more common condition, predisposing to abortion, than an impoverished or too rich state of the blood. Uræmia is a very common concurrent, if not sufficient cause of abortions, even when albumen is not abundant in the excretion. It is probably too restricted a view of the subject, when considering it in this relation, to insist that the vitiating product consists of urea and the compounds resulting from its decomposition in the blood; and while I have no doubt but uræmic poison is a quite common cause of premature delivery, first, by causing the death of the fœtus, and second, giving origin to great nervous disturbance in the system of the mother, I am equally convinced that great disturbance in the functions of the kidneys often results in states of the blood incompatible with the continuance of gestation without there being necessarily a superabundance of urea in it. In many sedentary women, in whom the circulation is very languid, and the excretory function of the skin inefficient, the onus of excretion falls upon the kidneys, and the congestion so readily produced by pressure impairs their ability to discharge it completely, leaving much of the effete material that ought to be eliminated to circulate through the placenta and exert its deleterious effects upon the blood of the fœtus. Syphilæmia is another far too frequent condition predisposing to abortions. It is not an uncommon thing, in large cities especially, to meet with women who, upon arriving at a certain period in pregnancy, experience symptoms indicating the death of the fœtus, and in the course of a few days, or sometimes several weeks, give birth to a child that had been dead from the date thus defined. I have known many instances of this kind that were traced to syphilitic taint, generally in the father, and sometimes in both. And as evidence of the syphilitic origin of the difficulty, the habit of miscarrying was cured by anti-syphilitic treatment during pregnancy. Perhaps all forms of toxæmia produce their effects by destroying the fœtus, and thus arresting pregnancy. Another class of poisons that operate deleteriously in arresting the growth of the ovum are those that induce the various forms of fever. I think medical men who have had best opportunities of observing will bear me out in the opinion that idio-miasm and koino-miasm both operate with sufficient intensity on the ovum through the blood of the mother to cause its death, even when the symptoms of fever were not manifest in the mother. Its efficiency in this respect, however, is increased upon the occurrence of fever in the system of the parent. It is often difficult indeed to decide whether the deleterious effects result directly from the poison or through the perturbations of the fevers. The contagions often cause the arrest of pregnancy and abortion. This is especially the case in the eruptive fevers, small-pox, measles, and scarlatina. The fœtus is often expelled during the progress of these fevers, and abortion is more likely to take place during the prevalence of them, even when the mother is not the subject of them. And this leads me to say that there is occasionally an epidemic tendency to abortion. From some occult cause operating on all pregnant women, a much larger number do miscarry in a certain district than is an ordinary average for the same number of pregnant women at other times. Another very common cause of abortion is habit.

After having miscarried at a particular period of gestation, a patient is quite liable to a recurrence of it at a similar period in subsequent pregnancies. I have known patients to have such a strong habit of this kind that they confidently expected to abort at a given week, and could predict it with great accuracy.

Affections of the ovum, or some part of it, are more directly or frequently the causes of abortion. Inflammation of the placenta sometimes takes place, causing effusion of fibrine into its tissues, condensing or rather hardening them, and obliterating them to such an extent as to impair its functions. Although placentitis may arise from sôme of the less appreciable causes, I think it is more commonly the effect of injuries inflicted by violence through the abdominal walls, by blows, falls, etc. The placenta becomes congested to such a degree as to damage its structure so largely as to render it incapable of discharging its functions. Congestion amounts sometimes to effusion of blood in its structures, hence the term placental apoplexy. In placentitis there is generally fever, pain, and tenderness over the region of the uterus where the organ is attached; but unless it is late in gestation, the symptoms are not sufficiently marked to become means of diagnosis, and as the inflammation of the placenta is generally accompanied with more or less metritis, it is quite impossible to separate them sufficiently to distinguish between them. Other changes are occasionally observed in the placenta; calcareous deposits are found in it sometimes, in fact not uncommonly, and fatty degeneration is another recorded condition of it. The placenta is also occasionally detached to a greater or less degree, most likely by undue contractions of the portion of the uterus upon which it is attached, or its vessels are ruptured by some other means, probably not, as has been conjectured, by vascular force, injecting the blood so strongly as to rupture the capillary and cause effusion from its margin. However the accident may be caused, bleeding announces its occurrence. The membranous portion of the ovum is not unfrequently the subject of diseases giving rise to abortion. They are occasionally so fragile as to rupture, and discharge the liquor between the chorion and amnion, or from the amniotic cavity itself. It is an interesting question sometimes, whence the clear watery fluid of hydrorrhœa of the uterus comes. Instances of intermittent discharge of quite a quantity of serous fluid from the vagina, during what turned out to be otherwise healthy gestations, for several months before confinement, must have fallen within the observation of most practitioners of extensive experience. Among several cases I have seen was one in which the discharge of what, at the time, was considered to be fluid from between the chorion and amnion, beginning in the sixth and continuing with intervals of only a few days during the whole of the subsequent months of pregnancy. Sometimes the fluid would gush forth unexpectedly to the amount of an ounce, or even more, and afterwards continue to drain away for two or three days, and then cease gradually. Judging from other cases that have come under my observation, these apparently innocuous discharges of fluid from the vagina during gestation begin later, generally not until the seventh or eighth month. Commencing at whatever time they may, I think they indicate a secreting space outside the amnion, believing that the evacuation of the liquor amnii will invariably arrest gestation. Most likely this secreting space is the cavity of the chorion, and that the fluid collects between the chorion and amnion, and at intervals breaks through this membrane. As it is well known that there is a cavity between these two membranes early in oval development, may not such cases of hysterrhœa represent instances of unusual continuance of this cavity? However this may be, discharge of clear liquor from the vagina, in any abundance during gestation, is an *almost* invariable evidence of rupture of the amnion, and presages abortion. Another disease of the membranes is dropsy of the amnion. This is not an unfrequent affection, as we find it existing to a moderate extent in cases where the full term of gestation has been reached, but it sometimes is so considerable as to cause abortion or premature labor. Dropsy of the amnion would seem to induce miscarriage by stretching the uterine muscles to a degree of irritability. Rapid increase of size is the main symptom. The patient attains a size two or three months beyond that which is usual at a particular period. There is undue fluctuation in the uterus, as ascertained by placing the fingers in forcible contact with the cervix in the vagina, and percussing the abdomen over the uterine tumor with the hand above the pubis. Accidents to the fœtus, of such a character as to deprive it of vitality, are among the causes of abortions. Falls upon substances that through the abdominal walls pierce or even bruise the head, chest, or other vital parts, are of this character. The cord is occasionally the subject of accidents also. It becomes wound around the neck, body, or limbs of the child so closely as to interrupt the circulation in it, and perhaps do other damage.

Montgomery believed that constriction of a limb by the cord was the cause of so-called intra-uterine amputation of the arms or legs. And sometimes the cord has been found knotted so tightly as to interrupt the circulation of the blood in its vessels, and thus lead to the death of the fœtus. It has been a question as to the mode of occurrence of these conditions of the umbilical cord, and there seems to be hardly any other way of accounting for the knots and coils about the neck or limbs but the motions of the child while the fluid is yet sufficiently great about it to permit of very free change of position. Some rare forms of accident cause rupture of the cord; and the hemorrhage consequent upon it is sufficient to account for the death of the fœtus and its consequent expulsion.

Symptoms of Abortion.—The symptoms which precede abortion and may be regarded as premonitory, in consequence of the wide difference in the predisposing conditions, cannot be very uniform, each one having something of its own peculiarities; but there are some general symptoms that are more or less common to them, and it may be well to mention them in a concise manner. In anæmia, uræmia, syphilæmia, and other conditions, of the blood that cause the death of the fœtus, there will be some symptoms common to them all. Signs of an arrest of gestation, such as a subsidence of the sympathies which formerly existed; the mammæ decrease in size and become flabby, the nausea, ptyalism, suddenly subside. If quickening has been experienced the motion ceases entirely, either gradually or suddenly, after a paroxysm of violent fœtal movements—perhaps convulsive—and the uterus gives the patient the idea of a heavy weight. Sometimes there is a feeling of coldness. The sense of death-like stillness is a very distressing symptom in some cases. A general nervousness, either depression or vague apprehension, hysteria in various shapes, sometimes occur. When congestion or inflammation precedes it, the symptoms, such as weight, heat, copious mucous or sanguineous discharges, chilliness, fever, etc., are common symptoms. In many cases there are no symptoms that can be regarded as premonitory, and symptoms denoting the commencement of the process of abortion are the first observed. They are three in number: 1st, pain; 2d, hemorrhage; and 3d, discharge of the liquor amnii. And they occur in frequency in about the manner I have mentioned them. By far the greater number of instances commence with pain, resembling labor-pain in being intermittent, in being regular, slight at first, and growing more severe, and becoming more frequent and longer in duration. After these have lasted for a greater or less length of time there is added to this symptom hemorrhage, which increases but little sometimes, while at others it becomes very alarming before the expulsion is complete. The discharge of the liquor amnii may take place any time after the pains commence, and before or after the hemorrhage has set in. Less frequently the first symptom is a gush of bloody serum from the vagina, which for several hours, and sometimes days, is succeeded by a slight watery discharge stained with blood; or the first gush is succeeded by a decidedly bloody flow that increases for some time, when pain begins and the process goes forward. Another way in which abortion begins is the sudden commencement of hemorrhage, which continues for a time and then is accompanied by pain. Whichever of these symptoms initiates the process of abortion, they all become a part of it before a termination is reached. There is also great difference in the progress of the more advanced symptoms. Not unfrequently with pain lasting but a few hours, and sometimes amounting to but little inconvenience, the contents of the uterus are expelled and the whole process terminates. At other times, and more frequently, the progress is more slow, pain lasting for several days, at intervals, before the whole is expelled, and, along with this rather tedious form, hemorrhage is a constant attendant, not excessive, but from its long continuance very exhausting to the patient. At other times the pain is trifling, not sufficient to expel the ovum, while the hemorrhage is copious and alarming. And again, the pain and hemorrhage are both slight, but continuous; not enough however to expel the fœtus nor exhaust the woman, but to separate the placenta sufficiently to destroy the vitality of the ovum, which remains in utero for an indefinite length of time—weeks, months, or even years. I met with an instance in which the fœtus, and the entire ovum, had remained in the uterus twenty-three months from the time it had been deprived of vitality. Generally, however, decomposition attacks the different tissues, a fœtid discharge continues for many days, or even weeks, until the decomposed ovum is wholly discharged in fœtid ichor, or sometimes at the occurrence of the next menstrual period the remainder of the putrid placenta. I have seen several instances where the processes of abortion had begun, and the symptoms entirely subsided, hemorrhage more than usual, sometimes alarming, recurred at the menstrual periods for two, three, or even four successive periods, when the putrid remains of a placenta were discharged, with relief from future attack. In the literature of the times we find frequent record of this class of cases, and Dr. Reeves, of Ohio, has recently given us an able paper on the obscure species of hemorrhage thus occurring. The muscular tissue of the uterus being in an undeveloped state, and consequently incapable of powerful contraction, and the cervix still in an elongated, narrow, and firm condition, the processes necessary to expel the ovum in the early months of gestation are protracted and painful compared to ordinary labor. It is therefore a rule that abortions are more tedious, and cause more suffering than labor at term. Notwithstanding this, we meet with cases of miscarriage in which delivery is even more rapid than is practicable in ordinary labor. In very early abortions the ovum is sometimes expelled as a total, the membranes being unruptured, and the fœtus contained in the bag of amniotic fluid. This is not often the case after the first few weeks; much more frequently the membranes are ruptured, the little fœtus expelled and lost, and the placenta retained for some time, and finally thrown off with difficulty.

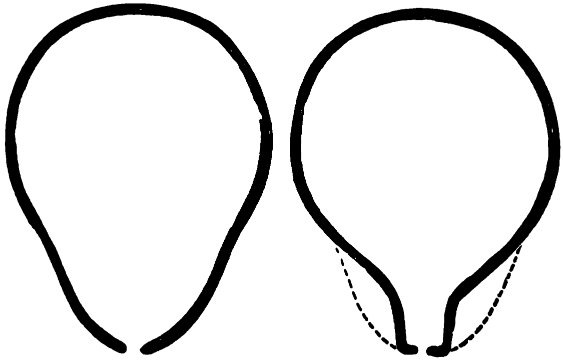


FIG. 82.—The shape of the Uterus in the early months of pregnancy compared to that of full term.

Diagnosis.—It is always desirable to be able to anticipate abortion and determine the nature of the predisposing condition, as upon the management of that will depend success. The fact of the patient having formerly aborted, with evidence of toxæmia in some of its forms, would be an important item in diagnosis, or the fact of her having evinced a habit of miscarriage by doing so at a particular time in the course of her pregnancy. And in many cases we shall be able to calculate with much certainty, either from the history of her previous pregnancies or our own observation of them. But in cases where we cannot thus expect abortion, we ought to detect its earliest symptoms, and clearly determine between it and other conditions which so much resemble it.

It is a very common thing for habitual abortions in the earlier weeks of pregnancy to pass for hemorrhages from other causes, but there are some facts that will very generally enable us to distinguish between them. When menorrhagia is the source of the hemorrhage, the attacks are much the same each month,—there is not likely to be several months of moderate menstruation, and then one severe and painful one. So in dysmenorrhœa, it is the same from month to month, and is not likely to manifest itself at irregular intervals.

Women sometimes think that if a menstrual discharge is postponed the hemorrhage ought to be more copious and painful than usual next time, as a compensation for the postponement, which of course is a mistake. Many cases of habitual abortion take place something in this way: The menses are regular for three, four, or even more months, and then it fails to appear at the usual time, but comes on in two weeks after time, or at next period is more copious and painful, and the copiousness consisting more in a longer continuance than any much more rapid or free flow; or, as I now know a patient to do every three or four months, pass over only one week and then have more than ordinary flow. These cases of early miscarriages, I think, are more frequent than is generally supposed, and may be detected by careful examination of the discharges, connected with the history of the case. We should remember that a woman's menstrual history should be consistent with itself. If irregular, it should be regularly so—either in copiousness or painfulness. We may also be very materially aided in our diagnosis by the microscope. If the discharges are examined after being placed under a stream of warm water until the globuline and fibrine of the blood have been carried away, any solid substance remaining will show the character of the case. And in this examination we should remember that the follicular and epithelial exfoliations of the decidua are often seen in menstrual discharges, and are generally found in dysmenorrhœa; but that to detect the villous arrangement of the chorion or small vascular ramifications is conclusive. It is seldom also that menstrual products are retained long enough to decompose and give out a cadaverous odor, while it is common to detect this odor in the discharge attendant upon miscarriages. But in cases more advanced the symptoms are usually more significant, and we may determine at the time, without much difficulty, the nature of the case—the postponement, or rather suppression, of the menses, the sympathies of pregnancy, and the supervention of pains and hemorrhage are almost conclusive. A physical examination will detect changes in the size, shape, and consistence of the uterus, changes in the cervix and os, and perhaps some of the ovum may be felt in the vagina or in the uterus through the patulous os uteri. We will be very much aided in our diagnosis and prognosis in abortion cases by having all the discharges saved and making a careful examination of them.

Prognosis.—The probabilities of abortion taking place under circumstances that have produced it previously may often be judged of with some degree of certainty. Uræmia does not often cause abortion after the first pregnancy, rarely it does so in the second, and much more rarely afterwards; while in syphilæmia it is very likely, without appropriate treatment, to be repeated in subsequent pregnancies. When a habit is established it is quite difficult to prevent it from taking place perpetually. The prognosis in individual cases depends upon many circumstances that must be judged of with reference to them at the time; and in forming an opinion of the probabilities of preventing abortion in any given case, we must bear in mind that after pain and hemorrhage have begun, miscarriage is not merely threatened but that it has begun, and that upon general principles the prevention will be difficult if at all possible. The occurrence of one of these symptoms without the other will, of course, be less serious than if both are established. I think, too, that hemorrhage is decidedly the most dangerous symptom of the two; but the single symptom that is most sure to be followed up by the completion of the process is the discharge of the liquor amnii. The occurrence of hemorrhage indicates a separation to a greater or less extent of the connection between the ovum and uterus, and hence the great danger of the destruction to the former. Hemorrhage that amounts to several ounces in the course of twenty-four hours is hardly compatible with the continuation of gestation in the first three months. Rapid and copious bleeding soon destroys the ovum during the first half of pregnancy with great uniformity; the older the fœtus, and larger the placental attachment, however, the more blood may be lost. But, to be more definite, I think the loss of six ounces of blood in forty-eight hours' time will be almost certainly followed by abortion in the first three months of pregnancy. But there are some remarkable exceptions to this remark. We ought, therefore, to look upon the persistence of hemorrhage as a grave symptom. If pain, with even a small discharge, persists for two or three days we should not expect to prevent abortion. After the discharge has continued for several days, if the discharge become fœtid, it is a pretty sure sign that abortion must occur.

The effects of miscarriage upon the woman are almost always injurious, sometimes fatal. The immediate, and sometimes disastrous consequences arise from hemorrhage. Although death from this accident, connected with abortion, is quite uncommon, there are such cases on record, and it must have occurred to the observation of most men of extensive experience in obstretrics to witness many narrow escapes from this termination. Quite numerous instances of great damage from loss of blood are constantly transpiring. The dangerous effects are so remote sometimes as to escape the attention of a careless observer, yet real, while others are very obvious in the permanent leucocythæmia which follows. Another effect, so common as to be the cause of great anxiety as a general rule, is acute inflammation, of various states of intensity and extent. Sometimes it gives rise to overwhelming metro-peritonitis that in a very few days destroys its victim, or, if less severe, endangers her life for several weeks, and leaves behind it adhesions, abscesses, or chronic inflammation in the abdominal cavity. Chronic inflammations are very frequent results of abortion, chronic metritis, cervicitis, with and without ulceration, and chronic perimetritis. Sterility on account of the damage done to the uterus and ovaria is a well-known effect. I have seen many women who in early married life had miscarriage produced to keep from having a child too soon, and thus suffered damage that ever afterwards made conception impossible, and changed their dread of the inconveniences of maternity to hopeless sterility, and the unhappiness invariably attendant upon it. Amenorrhœa, menorrhagia, dysmenorrhœa, and the various displacements of the uterus, often have their origin in abortions. Another form of acute disease, besides hemorrhage and inflammation, is toxæmic fever, that runs on to a great length, wearing out the patient by its great continuance, its exhaustive discharges, and nervous irritations. This form of fever is produced by absorption of the products of decomposition of retained substances, and even blood. When abortion becomes a complication of acute disease, as the various forms of fevers—typhoid especially—the inflammations, pneumonia, or enteritis, particularly dysentery, it often determines the tendency to fatal consequences. Indeed, as I have before intimated, abortion is never free from danger, and very seldom leaves a woman who has suffered from it without serious damage in some way. It is hardly necessary to say, in concluding this brief summary of the prominent consequences of abortion, that the effects of it, induced by forcible measures intentionally applied, are more serious than such as arise from most other causes.

Treatment.—The objects of treatment are, first, to save the embryo by preventing the arrest of development; or, second, when this is impossible, to promote its expulsion, and thus avoid damage to the woman.

Preventive treatment—the most important of the two, because when successful it secures the safety of the fœtus, and generally the mother also against the risks which accompany the processes of abortion—divides itself into two parts, viz.: the correction or cure of the causing conditions, and, when this is impossible, as much as possible to neutralize their effects. It will hardly be necessary for me to do more than enter upon the first part of the subject in a very general way, as the educated physician will be capable of adapting the particular processes of treatment required for the cure of these causing conditions. Congestion and inflammations of the uterus require only to be recognized to be properly managed by the physician, as the remedies are the same as in other conditions of the system—quietude, abstinence from all sources of excitement—antiphlogistic and alterative measures constituting the main items. The chronic inflammations of the uterus and cervix, with or without ulceration, will require treatment more frequently than the acute, and the question will arise, how far we are justified in the employment of the ordinary measures for the cure of these states during pregnancy. The highest authority on this subject, Dr. Bennet, in his treatise on the diseases of the uterus, advocates the treatment of them in the same way during the earlier months of pregnancy as before the occurrence of it, by the use of nitrate of silver, and even the stronger caustics if necessary, vaginal injections, baths, etc., teaching us that this is the right way to *avoid abortion.* Dr. Whitehead, on abortion, follows Dr. Bennet's lead. But I have been much more cautious and have pursued a milder course, using injections and baths, without strong local applications, and watching for the effects of the irritation caused by the inflammation, and counteracting by other means, such as anodynes—for pain especially—rest, and abstinence from stimuli, etc. Sitz-baths and injections, with water compress over the uterine region with much soreness, will often palliate these cases and prevent the initiation of the symptoms of abortion; but if at any time—and this should be insisted upon and the patient supplied with the means—uterine intermitting pains occur they should be allayed without loss of time by a full dose of opium or some of its preparations. This kind of treatment and vigilance should be continued during the whole time of gestation, as the symptoms may occur at any time. Great nervous excitability must be met by proper treatment—such for the most part as will promote the general health of the patient. And the first thing I should insist upon is to expose the patient as much as possible to the purest air and sunshine; she should be out doors, if possible, all her waking hours—the more of them the better—and sleep in the open air as nearly as she can. With the exposure she should take as much exercise as she is capable of bearing. The medicines adapted to this condition are such as supply most oxygen to the tissues. Among the most useful for this purpose are the peroxide of hydrogen, the permanganate of potassa, and the chlorate of potassa. These are better than direct sedatives or anodynes. The anodyne that has seemed to me to be the best suited to this state of the system is belladonna, and the mode of using, to the vaginal surface in a medicated pessary at night. Its effects will last almost or quite twenty-four hours. I think belladonna applied in the same manner is highly efficacious in interrupting the reflex effects of irritation, in the bladder especially, and somewhat in the rectum, and in fact elsewhere. When the irritation of the rectum in dysentery, or other portions of the alimentary canal in enteritis, is very considerable, opium given to narcotism, if necessary, is the most efficacious remedy we possess. Some of the most important causing conditions are the states of the blood and general nutrition. Chloro-anæmia is so common a condition of system giving rise to abortions, especially in large cities, that it will claim a large part of our attention. When the blood is impoverished and the system is merely anæmic, the iron tonics for the blood, and, if the digestive organs require them, the bitters and antacids, animal diet in abundance, care and exercise, will be the best measures we can adopt. But if connected with this we have the neuralgias of chlorosis, alteratives must be added judiciously—three or four grains of blue mass every second or third night, followed in the morning with seidlitz powder, will suffice ordinarily for this purpose, while the patient may take some soluble preparation of iron between times. Syphilæmia is another condition of the blood found more frequently in large cities than among a rural population, and not unfrequently manifested in abortions. I have been more successful in this condition by commencing anti-syphilitic remedies very soon after the patients found themselves pregnant, and keeping them up more or less constantly until time for confinement. My plan is to give pil. hyd. in small doses (half a grain) twice a day until the slightest possible effects show themselves in the mouth, and then succeed it by iodide of potassium for some weeks, in the comp. syrup of stillingium, twice or even three times in the course of gestation. I use the mercury and the iodide and syrup all the rest of the time. This may be an unnecessary amount of medication, but it has been so successful that I feel justified in repeating it. Very little can be done for uræmia during pregnancy but to keep up a good state of the secretions by the employment of colchicum as liberally as the stomach and bowels will bear, and the use of citric acid as much as the patient can be induced to take. Abortion in this condition is often inevitable, and generally curative of the uræmic condition. In acute inflammations of the lungs or other organs, and idiopathic fevers, we should bear in mind the probable occurrence of abortion when the patient is pregnant, and while we treat the disease with all the energy necessary to relieve the woman, we should leave opiates in possession of the nurse, and advise their use as liberally as we dare, should symptoms of abortion present themselves. Habit is another and very important predisposing condition. It is generally combined with some other, perhaps oftener with chronic inflammations and ulcerations; but sometimes it is the only recognizable cause of miscarriage. When a patient has miscarried twice at the same period of two pregnancies we should regard the habit as established, and anticipate a like result in future, and use remedies calculated to prevent it. Our success will depend much upon the promptitude with which our remedies are applied. We ought to place the general health of the patient in the best possible condition, and as the time approaches require her to abstain from all excitement, especially sexual, exercise moderately but not excessively, until she experiences premonitory symptoms, which she should be taught to watch for and recognize. We shall seldom succeed when the premonitory symptoms do not antedate the actual commencement. Generally, in fact in a large majority of cases, pains precede any damage to the connection between the ovum and uterus, or to the integrity of the ovum, for many hours, and often several days, and might be recognized before they have attained sufficient force to be disastrous. When they can be thus recognized, and our patient instructed in the use of opiates, we may often succeed in arresting the process before damage is incurred, and enable the patient to go forward. I usually describe these slight pains to my patient, require her to watch for them, and when once recognized direct her to take a tablespoonful of camphorated tincture of opium, and repeat in two hours if the pains have not subsided. She should be directed to watch and anticipate this way during the whole term. I have succeeded in enabling many women, who had been sterile for years from the habit induced in early married life, by this simple method to go their full time, and thus interrupting the tendency which had so tenaciously adhered to them. When abortion symptoms begin with discharge of liquor amnii this course will not succeed; but it is extremely rare for this to be the case; well-marked pains have been overlooked almost always when this appears to be the condition. Similar remarks are true of hemorrhage; but if the hemorrhage is slight and the discharge taking place slowly, we are justified in using opium and astringents for a sufficient time to make the trial. I am much in the habit of giving acid. sul. arom. in half-drachm doses every three or four hours, and keeping the patient entirely quiet, letting her have cold drinks and but little food. Plumb. sub. act. mattico, and other mineral and vegetable tonics are used by many physicians to restrain the bleeding, while opium is very properly given to quiet the pain. I do not forget, in speaking thus freely about the use of opium that peculiarities in some persons make it almost useless; yet I remember the utter unreliability of other remedies in these cases and risk such disagreements. When it cannot be borne by the stomach it may be given and retained in the rectum. One-fourth or the half of a grain of sul. morph., dissolved in a tablespoonful of tepid water and thrown into the rectum with an ear syringe, will often be practicable and efficacious. If the symptoms are such as to make it appear impossible to arrest the process, we must promote its expulsion as speedily as possible, as its presence is a source of danger to the woman. I have endeavored to point out the symptoms that would decide our course in this respect. I would refer the reader to the remarks made under the head of Prognosis. The circumstances attendant upon the progress of the case will determine the energy of the measures employed. Before we adopt any treatment, if the symptoms have become urgent—that is, if there is much hemorrhage or severe pain or fever—we should examine the condition of the uterus. If the mouth is closed and the hemorrhage is not excessive we may satisfy ourselves by giving ergot, requiring the patient to be quiet and await the occurrence of reasons for interference. When there is but moderate hemorrhage, when there is no sign of toxæmia or inflammation, I repeat, we ought not to interfere otherwise than to give medicine to promote the discharge. When the bleeding is considerable, and the patient begins to fail from loss of blood, with a prospect of continuance, we are justified in resorting to decided measures to check it. I am satisfied, from not very limited observation, that such cases ought not to be trusted to the administration of astringents internally, as they are entirely unreliable. The local application of ice and ice-water to the abdomen externally, and injections of ice-water and the introduction of pieces of ice into the vagina, are often very efficient hæmostatic means. But by far the best means of arresting the hemorrhage before the placenta is expelled is the tampon, used in the vagina or in the cervix uteri.

The gum-elastic air-bag is very handy, and a very efficient plug. It may be introduced and inflated so as to fill the vagina completely, and allowed to remain for twenty-four hours, watching it and keeping it inflated sufficiently to hold the bleeding in check. In twenty-four hours it may be removed, and the vagina washed out with cold water. Should there be a return of the hemorrhage the air-bag may be again introduced, etc. It may be thus used for a number of days if necessary, or until the case terminates, or the hemorrhage for which it is used has subsided. The presence of this colpeurynter in the vagina often stimulates the uterus to contraction, and by drawing upon the cervix through the vaginal wall aids in dilating the os uteri, and so promoting the discharge of the ovum from the uterus. Hence upon removing the tampon the ovum is sometimes found in the vagina. When we cannot command the air-bag we may make a good tampon out of cotton wadding, oiling it thoroughly—and this should always be done. It can be introduced in small pieces until the vaginal cavity is thoroughly filled. Sometimes two or three fine cambric handkerchiefs, when nothing better can be procured, will answer the purpose, but the cotton is much better. A still more effective method of stopping the hemorrhage is to introduce compressed sponge into the os uteri. The sponge expands, fills up the cavity of the cervix and stops the hemorrhage, gradually dilates it, and stimulates the uterus to an expulsion of the ovum. The compressed sponge is hence an extremely

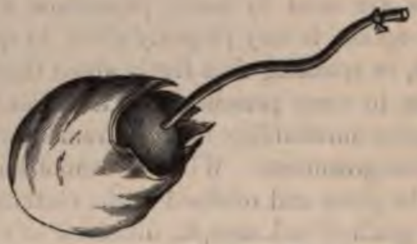


FIG. 83.—Gum-elastic Air-Bag, with a handkerchief over it, the more effectually to entangle the blood.

valuable means of saving loss of blood and terminating the case. If the os uteri is open so as to admit the finger, the placenta should be removed, whether there is much hemorrhage or not. From careful observation I am convinced that in cases where there is much hemorrhage there is also irregular contraction of the uterus, and that the placenta is held against expulsion by being partially imprisoned in a secondary cavity beyond a constriction. I think the introduction of metallic instruments into the uterine cavity for the removal of one of these small placenta very objectionable, and do not resort to them if I can succeed without them. If the mouth of the uterus will admit the finger we should introduce it and bring away the placenta with it. In order to do this certainly and with facility the patient should be placed in a position where we can command the use of both hands perfectly. Then, with the index finger of one hand in the mouth of the uterus, the other hand above the pubis should search for and find the fundus—which a little practice will render easy—and depress the whole organ by pressing downward, and the fundus backward, until the os is very near the vaginal orifice, and the introduced finger will pass high up into the cavity. In persons not particularly fat this may be done almost invariably. If we have difficulty in depressing the uterus low enough with the hand above the symphysis, we may make traction with the finger

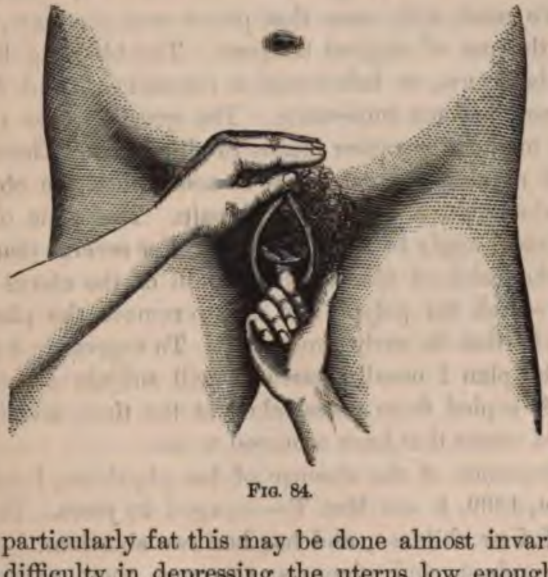


FIG. 84.

in the cervical cavity, and then pull it down. This manœuvre will aid us very materially in getting complete command of the organ. Sometimes I have succeeded in getting the fundus retroverted into the sacral cavity, and in this way had the organ supported very firmly while my finger was detaching and removing the placenta. With the finger introduced and the uterus thus fixed by the other hand, we may survey the cavity of the organ pretty thoroughly and at our leisure. And as I have before said, we will often find the placenta partially detached and lying in the main cavity, while we may trace a portion of it up into a small cavity beyond a constriction. We should, if it does not require too much force, pass the finger through the constriction and detach the adherent part and remove the whole. If this is difficult, on account of the remoteness of the stricture or its great firmness, we should content ourselves with severing the accessible portion with our finger and removing it. When this last is done the hemorrhage will be very much moderated, so much as not materially to increase the exhaustion, and the remainder of the offending substance will be expelled. So soon as the placenta is removed hemorrhage will cease, and we may be sure when some hemorrhage continues that the placenta is still there. We meet with cases that prove very obstinate, notwithstanding the use of vaginal tampons. The bleeding keeps up, or toxæmia occurs, or inflammation commences, and dilatation and delivery become imperative. The question then comes up as to the method, or rather means of dilatation. The sponge is rough and requires several hours to accomplish the object, and often produces great irritation and pain. The same objections to some extent apply to the sea-tangle. For several years I have been in the habit of dilating the mouth of the uterus with my finger to search for polypi, and also to remove the placenta, in cases of abortion in early pregnancy. To express in a practical manner the plan I usually pursue I will subjoin a case of my own. It is copied from notes taken at the time, and is but an example of others that have occurred to me.

In consequence of the absence of her physician, I was called, August 1st, 1869, to see Mrs. T——, aged 28 years. She is the mother of four children, and has had two abortions. Although ordinarily robust and vigorous, she was then pale and exsanguined, and informed me that she had fainted during the forenoon, and could not be raised in bed without faintness. She had been the subject of hemorrhage from the uterus for the four weeks preceding my visit, without any intermission. She said that on the first of June she had expected to menstruate, but failed to do so. Instead of the ordinary discharge she had enough to merely stain her linen. At the same time she was seized with chilliness, followed by febrile reaction; there was pain in the pelvic region, and she had nausea, headache, and great depression. She attributed these symptoms and the suppression to a cold bath she had indulged in on the previous day. Under the simplest treatment, in a few days she was as well as usual. On the first or second day of July she commenced flowing, at first moderately, but afterwards so copiously as to discharge several large clots during the day. Pain of a paroxysmal character preceded the commencement of the flow, and continued during the first three days, when it entirely subsided. She did not believe herself pregnant, and after repeated examinations by her attendant had been assured that she was not. I found the uterus low down in the pelvis and decidedly enlarged, especially antero-posteriorly. The fundus was slightly turned backwards. The cervix was but little if at all altered in shape, quite firm, and the os was not open. Believing that the body of the organ contained some solid substance, probably a placenta, I determined to try to dislodge it. With the left hand I pressed firmly down through the superior strait until the fundus of the uterus was turned well back into the hollow of the sacrum, while with the index and middle fingers in the vagina I inclined the cervix upward toward the symphysis. With the organ in this position, the point of the index finger was pressed steadily into the os uteri. This gradually yielded, and in twenty minutes, with the employment of very slight force, the finger had entered the cavity of the uterus. I found within it a placenta that was prevented from being easily removed by an irregular contraction that encircled a portion of it. Traction with the finger passed above, so as to hook over it, soon caused it to slip out of the constriction; and very little more effort withdrew it wholly. I greatly prefer causing the descent of the uterus this way, and dilating with my fingers, than using the sponge or any instrument.

The instruments most useful to remove the placenta in early abortions are the placenta forceps and hook. The former were recommended by Dr. Bond, of New York, and the latter by Dr. Dewees. After the os uteri is dilated sufficiently to permit the introduction of the forefinger, that member should act as a guide, and until such dilatation is effected the instruments are impracticable. The finger is to reach and remain in contact with the edge of the placenta, while the forceps may be passed along it, and, thus guided, seize the placenta and slowly draw it away. If we press the jaws of the instrument too strongly together we shall pinch off a piece, and if we draw too strongly we shall tear it. By gentleness and continued traction we will often succeed in dislodging the placenta and removing it. If the hold should give way, of course we would renew it as often as necessary. The hook, I think, is a more efficient instrument than the forceps. We may easily extemporize an instrument of this kind out of a large knitting-needle, by bending one end of it into a small hook. Great caution should be exercised to avoid doing injury to the uterus or vagina. The hook should always be kept in contact with the guiding finger, and never be allowed so far that we do not exactly know where it is.

The hook may be passed along the index finger as a guide to the placenta, made to transfix the part in contact with the finger, and rest its point on that member. Gentle traction will often start the placenta, and sometimes bring it out directly. Often the hook will tear out, and we will be obliged to renew our hold again and again, and finally succeed only by much manœuvring and management.

LABOR.

This term includes all the processes by which the uterus is emptied of its contents, after the time when the fœtus is viable. We apply the epithet premature in cases where labor takes place before full term. Premature labor may occur at any time between the middle of the seventh month and the end of the ninth. In very rare instances children born before that time have lived; but such cases are so uncommon that we must place them in the category of exceptions to the ordinary rule.

Labor at term may be natural or difficult. We may regard any case of labor natural in which there is a practicable presentation, and that terminates within twenty-four hours, unattended with any circumstance calculated to excite apprehensions as to the safety of either mother or child. The general conditions of all varieties of labor are essentially the same, the varieties differing only in non-essential particulars; hence, without further preliminaries, I shall describe natural labor as the type, and give the differences under the other division above mentioned. While the only force absolutely necessary for the accomplishment of labor is furnished by the action of the uterus, in many instances, some of the time during this process almost every muscle in the body co-operates, directly or indirectly, for the expulsion of the fœtus. Recorded cases sufficiently prove—in fact the observation of most men of enlarged experience furnishes instances alike conclusive—that no force but what the uterus is capable of exerting is requisite for a speedy termination of labor. Generally, however, the uterus begins to act independent of other muscles; after a greater or less length of time the muscles of the abdomen, diaphragm, and chest are brought into action, and as the second stage advances all the muscles of the trunk and extremities co-operate with desperate vigor for the accomplishment of the grand purpose which has taken possession of all the energies of the body and mind of the woman. This force of the combined muscles of the whole body is applied to the fœtus, directly and indirectly, for the purpose of overcoming the resistance opposed to its passage through the os and cervix uteri, vaginal canal, and external organs of generation, dilating them to a certain extent by violence. In addition to this there is more or less resistance to be encountered by the pelvis, if nothing more than in changing the direction of the diameters of the fœtal head in correspondence to the most favorable measurements of the pelvic cavity. Sometimes the resistance of the pelvis is much greater than this, and the passage of the head is impracticable until it is compressed into a smaller space and moulded by elongation into a more favorable shape for its passage. This last is the most serious ordinary resistance necessary to be overcome by the parturient forces, and is the cause of very great suffering in many instances of even natural labor.

The causes which determine the commencement of labor have been the subject of much ingenious speculation and controversy, without definite settlement. Three circumstances are present as a general rule, and, in some way not explained by our present knowledge of physiology, are connected with the beginning of labor at term, viz.: the perfect development of the ovum in all its parts, insuring the viability of the fœtus; the entire evolution of the cervical cavity, and the return of the menstrual period. When these conditions coincide, the time ordinarily observed in gestation is up, and everything in readiness for expulsion. Now what the existing circumstance which brings on the ungovernable tenesmus that will not be allayed until the body which has become a source of irritation and pain is extruded, is, like other ultimate facts, occult, and the proper subject for speculation, but of no practical importance. Dismissing the subject, therefore, we will study the phenomena of labor.

Labor is preceded and attended by certain obvious phenomena which, for want of a better term, are called symptoms. The first symptoms or signs observed are evidences of the preparation which is going forward in the parts concerned for the approaching struggle. The one most evident to the patient and friends is a descent of the uterus as a mass, so that the fundus is lower than it had before been; the cervix is also lower down in the pelvis, and this part of the uterus, containing generally the fœtal head, is, if not wholly, the most of it, deep in the pelvic excavation. The subsidence of the tumor and the relief thus given by removing the distention from the abdomen cause the patient to feel more active and "light" than for some weeks previous, but with it there is also, in many instances, vesical and rectal tenesmus, causing the patient to go to stool and pass her urine more frequently than ordinary. This inconvenience, at first slight, gradually increases, and becomes more urgent until the first stage of labor is established, and is an ordinary symptom during that part of labor.

The subsidence of the abdomen generally begins early in the ninth month, and is very gradual until within a few days of labor, when the contraction of the fibres of the fundus and body become so decided as to distend the cervical portion, already in the pelvis, by intruding the liquor amnii and fœtal head into it, the tumor in the abdomen becoming decidedly less. At the commencement of labor, and for four or five days anterior to it, the walls of the body and fundus uteri are thickened, and become harder to the touch than before, while, on account of the stretching just mentioned, the walls of the cervical portion are thinner and more elastic. At the same time with the subsidence of the uterine tumor, the external organs become more turgid with blood, darker in color, and secrete more abundantly the mucus which is their natural product. The vaginal canal, labia, and perinæum become relaxed and easily distensible.

Labor is divided into three stages: the first is completed when the os uteri is dilated sufficiently to let the fœtus pass, and the membranes are ruptured; the second begins at this time, and ends in the entire expulsion of the fœtus; the third consists in the expulsion of membranes and placenta. Each stage is characterized by well-marked symptoms. The commencement of labor is signalled by an increase and somewhat changed state of the vaginal discharges, indicating the beginning of dilatation. In addition to the ordinary mucus, there is a lump of glairy or vitreous substance, generally quite distinct, and tinged with blood. This kind of discharge is called by the women themselves a show. At the same time, or very soon afterward, or possibly before, the patient is conscious of occasional pain of a marked character, returning at longer or shorter intervals, and entirely subsiding into complete ease, with the exception of the rectal and vesical tenesmus, which is more urgent than before these symptoms began. The pains are at first so slight that they are merely recurring uneasiness, and at such long intervals as to cause the patient sometimes to doubt their character. They, however, become more obvious until they cause decided suffering, and finally they are excruciating. The intervals between them become gradually shorter until, from having been thirty or sixty minutes apart, they may be within two or three minutes of each other. The pains of the first stage are sharp or cutting, located variously, often shooting through the back, hips, thighs, and abdomen, occasionally confined to the back and hips, or to the front part of the abdomen. With the beginning of these pains there is often a nervous trembling, sometimes attended with a sensation of coldness, cold hands and feet, but generally the shaking is not accompanied with coldness. It is not a chill but a shake. This trembling is mostly very moderate in its intensity, but in some patients of nervous temperament it becomes violent, amounting to a species of convulsion.

It is usually more violent just before the access of the different pains, each being preceded by a fit of trembling. The distress of the first stage is also increased by the frequent recurrence of nausea and vomiting, and this symptom is apt to be more prominent just before the accession of pain. In consequence of the sharp piercing character of the pains, the patient complains loudly, she shrinks from them, and places herself in a position in which the pain is least violent, some keeping quiet, while others walk and move about the room trying, as they say, to work them off. After a greater or less length of time—from one to many hours—the pains change in character somewhat, and the membranes rupture, discharging a portion of the liquor amnii. The rupture of the membranes takes place generally after they have been pressed through the completely dilated os far enough to press upon the perinæum with considerable force, and pout forward toward the arch of the symphysis. Ordinarily not more than twenty per cent. of the amniotic fluid is discharged, as the head engages in the os uteri and vagina so as to plug them against the flow of it. While this is the order of relationship between the pain and ruptured membranes, there are many exceptions to it. The ovum is sometimes expelled whole, the membranes not rupturing during either the first or second stage. Sometimes the membranes rupture during the preparatory stage, perhaps by the tonic contraction of the fibres of the body and fundus I have described as taking place at the time of the subsidence of the uterine tumor. While the patient is sitting quietly, or even lying in bed, she suddenly feels herself flooded, and upon examining her linen finds it wet with the clear liquor amnii. This fluid continues to come in gushes of greater or less quantities, at uncertain intervals, until the uterus is drained of it, when the labor which succeeds is called a dry labor, and is usually more painful and protracted. The loss of the amniotic fluid may precede the occurrence of pain a number of days, but it is usually followed by efficient labor-pains in a few hours. Again the membranes may withstand the force of the pains until the uterine orifice is partially dilated, and then give way. The two items of the first stage—dilatation and rupture of the membranes—it will be seen, are not uniformly related one to the other. It should be remarked in this connection, that in the first stage no part of the muscular system co-operates with the uterus, and the muscles, when in action, are used by the patient to oppose the continuance and force of the pains. The uterus is alone in its action. The pulse is usually small, and quickened during the pain somewhat, but it is without force. The phenomena are nervous. The patient is restless and agitated, and there is no vascular reaction, less heat than natural, no increased activity of the skin, and the urine is usually pale and abundant. There is no constant correspondence between the force and urgency of the pains in this stage and the rapidity of dilatation—more frequently the greater the pain the slower the dilatation; but I think it may be said that the more nausea and vomiting the more rapidly the mouth of the womb relaxes. The trembling is observed to occur most during the pretty active dilatation of the os uteri also. After the uterus is fully opened, and the membranes have torn, there is a pause in the pains, sometimes for half an hour, or even longer, usually, however, only for a few moments, and when the pains recur there is a marked change in them in some respects;—instead of being so tormenting they become more tolerable, and seem to impart new energy to the patient; she begins to co-operate with them by bringing other portions of the muscular system into action; the abdominal muscles, the diaphragm, the muscles of respiration, and all the voluntary muscles unite at the accession of each pain in one great tenesmic effort of expulsion. In this the second stage we witness the phenomena that suggest the term *labor*. The patient soon becomes warm, is bathed in perspiration, breathes deep and rapidly; the color mounts to her face, which is all aglow with excitement; the pulse is accelerated during the pain, and is full and strong. The whole appearance of the woman gives the idea of energetic and earnest exertion. The intervals between the pains are more free from suffering than in the first stage, and as it advances and a sense of fatigue ensues the patient often sinks into a refreshing sleep, so sweet and calm as to give her much rest and comfort. The intervals become shorter, and the length and force of the pains greater progressively, until finally one that seems to combine the energy and duration of half a dozen into one. This arouses the patient to desperate exertion; every muscle is strained to its utmost tension; her teeth are set firmly together; the blood seems almost ready to burst through the capillaries of the face; the eyes are lit up with startling brightness, and the unutterable agony of the moment culminates in a piercing scream, when she falls back exhausted by the terrible effort, and upon examination it will be found that the head is expelled. A longer interval now ensues, followed by a less severe pain, or perhaps several, which expels first the shoulders, and next the whole body of the child. The transition from agony that scarcely has a parallel in human suffering, to one of comfort, almost always prompts the patient to the most fervent expressions of gratitude to all who have been with her in her sufferings, and expressions of joy in the relief thus suddenly found.

At the termination of the second stage of labor the violent contractions of the uterus cease, and the organ remains quiet for a short time; the tonic contraction gradually lessens the size of its cavity, until, in the course of twenty minutes or more, a discharge of blood, amounting to a few ounces, issues from the vagina, and the patient experiences pain. This discharge of blood is a sign that the placenta is separated from the uterus, and the pain usually expels it from the uterus into the vagina. Here the placenta remains a short time longer, but is finally extruded from the vagina by the occurrence of one or more pains, and labor is completed. In rare instances the placenta remains in the vagina for a number of hours. I knew an instance where it must have been retained in that cavity for thirty-six hours, the patient being comfortable and free from pain during that time. It is not so readily expelled from primipara as multipara. The different stages of labor are relatively of diverse duration; the first is longer than both the others, and the duration of the second exceeds the third very greatly. Perhaps we can approximate correctness of average by saying that the first stage lasts from four to six hours, the second from one to four, and the third from thirty minutes to an hour, making the length of labor as a whole from six to eight hours. Primipara have a more tedious time ordinarily than multipara, and the extremes of age in this class of patients are supposed to add to this deviation, the pelvis of very young patients not being sufficiently expanded to allow of easy passage, while the soft parts of aged primipara are so rigid and unyielding as often to impede the passage of the head in a very decided manner.

The mechanism of labor is quite complicated, and must be studied attentively to be able to afford appropriate aid in cases of difficulty. The passage of the head through the cervix uteri is effected by the force exerted by the uterus upon the fœtus. There is no doubt but that the mouth of the uterus is rendered dilatable by the changes that immediately precede labor, but that it is generally opened by force. This force is more effective sometimes than others, and dilatation is complete in a very short time comparatively; but even in instances where this is the case, the pains that accomplish the first stage of labor cause more suffering than those of the second. The dilatation of the os uteri is effected by the pressure of the membranes distended with liquor amnii into it. In the very beginning of labor the membranes are inside the mouth of the uterus; soon they intrude themselves into this opening, enlarging it somewhat; still farther along they protrude through it, forming a round, soft, elastic tumor containing the amniotic fluid. This is called the bag of waters, and by its gentle pressure outward upon the ring formed by the edge of the uterine mouth gradually dilates it. When this dilatation of the mouth of the uterus is complete, the office of the bag of waters is finished, and the force of the uterus presses the liquor amnii strongly enough into it to tear the membranes and discharge the waters. The *vagina*, especially the upper part, is partially dilated by the distended membranes being pressed forcibly down into it, but the head in passing through it completes that object.

At the beginning of labor the fœtus is in a state of compact flexion; as remarked by Dr. Tyler Smith, every part of it is flexed. The legs, thighs, arms, back, and neck are all bent up to the smallest space. This is so remarkably the case with the neck that the occiput is the most dependent part, while the face looks obliquely upward, with the chin bent strongly against the chest. The quantity of liquor amnii is sufficient at this time to fill up the interspaces formed by the inequalities of the surface in such manner that the angles formed by the limbs do not press strongly against the walls of the uterus. It thus forms an oval mass, with the large end downward in head presentations, the head being dependent and the breech the most elevated portion. It lies in the uterus with the back obliquely to one side, and the belly to the other side of the mother. In most cases of labor the head enters the pelvis, as before stated, anterior to the commencement of active labor, and this movement belongs to the preparatory stage; but in many other instances it remains at the superior strait until the muscular contractions of the uterus force it down. The head in either case is found to have become engaged in the pelvis in an oblique direction, and these directions are so uniformly observed that rules have been devised by which to calculate them. It will be remembered that the upper part of the head is the most dependent. This portion of the head is called the vertex, and the student should have a clear idea of the meaning of these terms. When we speak of the occiput, we mean the part of the head formed of the occipital bone, while the vertex means the top or summit of the head; it is that portion of the head formed by the posterior portions of the parietal bones, just anterior to the posterior fontanelle.

The occiput presents, or is lower down, as a whole, than any other bone of the skull; but the uppermost part of the occiput and the back part of the parietal bones form the most dependent part of the cephalic tumor. In ordinary cases these parts, however, are not within the easiest reach of the finger, and may be said to be nearer to the coccyx, but not as near the vaginal orifice as some other parts of the head. I have tried to explain, in describing the arrangement of the soft parts on the pelvis, why this oblique direction is given to the head as it enters the pelvic brim. It is only in cases when the disparity between the size of the head and pelvis is such that the head is too small to be embraced by the circumference of the pelvic brim, but floats about loosely, when we find variation with reference to this rule. I shall have occasion after a while to describe other positions of head presentations beside those of the vertex, but now shall give the mechanism of vertex presentations, as understood by the most accurate observers. Naegele has done more to render clear the subject of presentations in labor, and their mechanism, than any other one individual of ancient or modern times. The dependent vertex is not at any point on the side of the pelvis, but it is nearer to some particular part of the pelvic wall than any other. For instance, the vertex is nearer to the region of the left acetabulum in most cases of labor; the occiput is in contact with the side of the pelvis somewhere during the whole time of the expulsion of the head. When we say, therefore, that the occiput is at the region of the left acetabulum, we know the most dependent part, or the vertex, is in close proximity. When the vertex is the presenting part (the most dependent), the occiput may be at the left acetabulum, while the forehead is at the right sacro-iliac synchondrosis (Fig. 85). The head is then in the first position, because the most frequent. When the occiput is at the posterior right side of the pelvis, the right sacro-iliac junction, it is in the second position, because it occurs the next most frequently (Fig. 86). The third position is

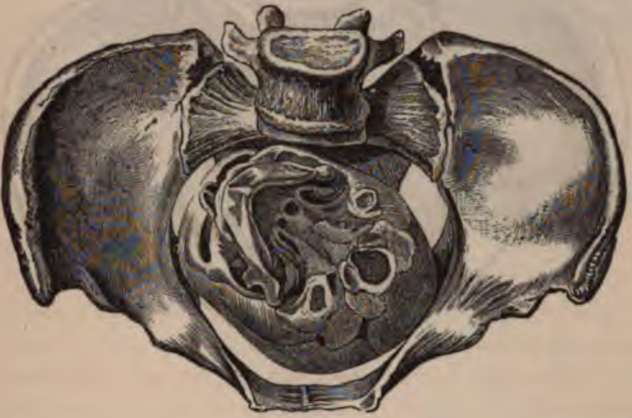


FIG. 85.

when the occiput is at the right acetabulum (Fig. 87), and the fourth when the occiput is at the left sacro-iliac synchondrosis (Fig. 88). In all the four presentations of the vertex here represented,

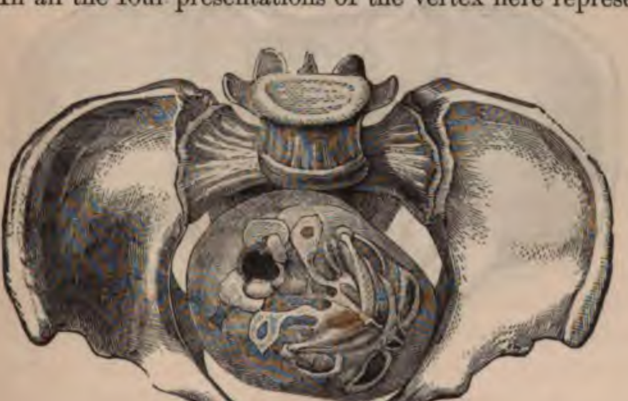


FIG. 86.

it enters the pelvis before or behind a direct transverse line. Two others have been mentioned by authors, and occur in cases of premature labor (Figs. 89 and 90), or when the head is very small compared to the size of the pelvis: they are occiput to pubis and occiput to sacrum, in direct antero-posterior direction. And other exceptional presentations are where the occiput is situated at one side of pelvis while the forehead is at the other (Figs. 91 and 92). In order that the mechanism of the second stage of labor may be thoroughly studied, such cases alone are suitable in which the size of the head is well adapted to the dimensions of the pelvis. In such instances the changes are complete, well marked,

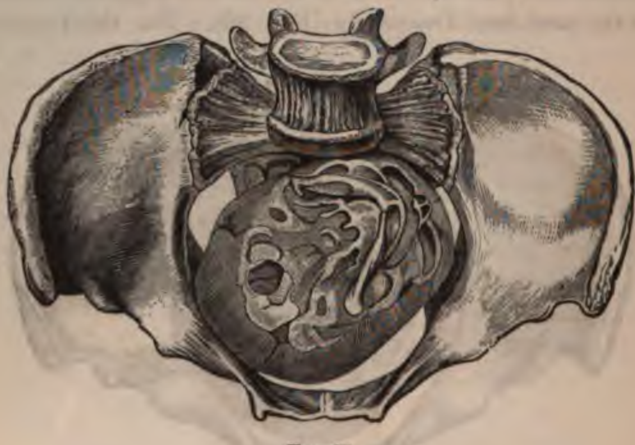


FIG. 87.

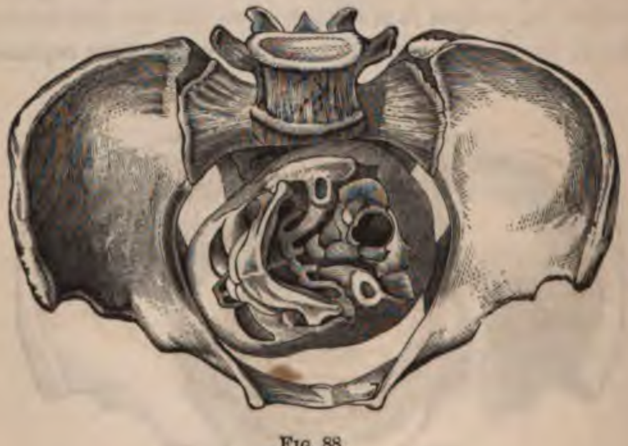


FIG. 88.

and with due attention easily followed. It will be a very profitable employment to the young practitioner, by way of perfecting himself in the diagnosis of the position of the presentation, and the changes which it undergoes during its transit—in suitable cases—so soon as the head is fairly engaged, to select some point of the skull, the most dependent the best, and keep his finger in constant contact with it until the head is expelled. In this way he will easily verify or correct his diagnosis. This is essentially the plan the celebrated Naegele observed in studying the mechanism of the second stage of labor. The strongly flexed position of the head, and the diagonal direction of the antero-posterior diameter

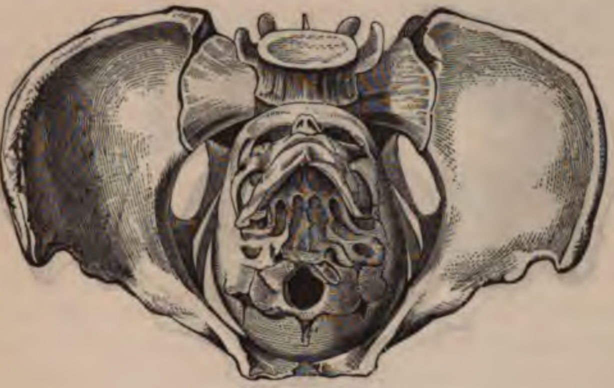


FIG. 89.

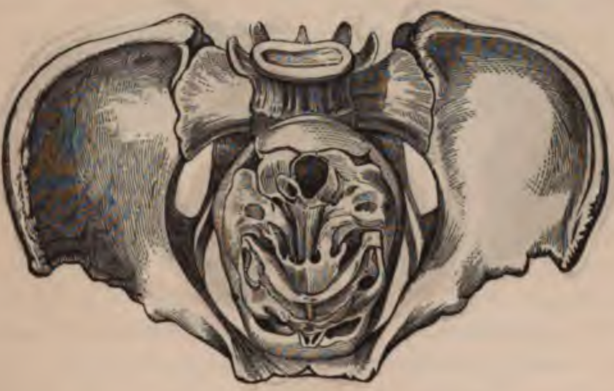


FIG. 90.

of the head, are preserved without change until the vertex begins to press upon the perinæum. At this time one angle of the head touches the spine of the ischium and is for the moment arrested; as it is urged downward by the pains, it glances, if I may be allowed the term, and slides forward on to the plane of the ischium—the anterior inclined plane. It passes along this plane downward and forward to the tubes and ramus of the ischium. When thus low it is at the open arch of the symphysis pubis, and in a few more efforts it has assumed a position under the symphysis pubis. There the antero-posterior

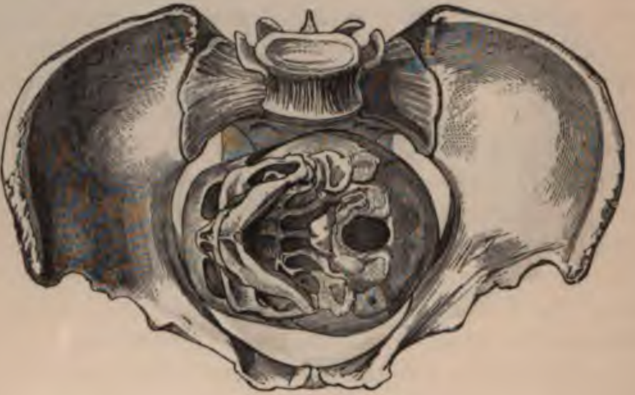


FIG. 91.

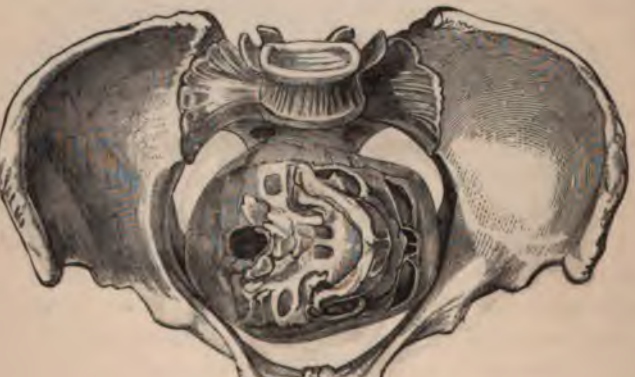


FIG. 92.

diameters of the head and pelvis correspond. This motion of the head is spiral; it is commenced within the pelvic cavity after the whole head has entered it, and is completed while the whole head is still within it, and at a time when the process of expulsion from the pelvis just begins. This spiral motion of the head ought to be more than half complete before the next movement begins. The occiput should be down well upon the perinæum, and begin to turn forward before the chin should depart from the breast, and the shoulders should be entering the pelvis in the opposite diagonal direction. Another influence which aids in the spiral change above described is, doubtless, the perinæum. For so soon as the vertex begins to press upon the perinæum, the larger part of the posterior part of the head is anterior to the perineal ridge, which is stretched across from one ischium to the other, and the vertex slides down the declivity from this point toward the fourchette. The forward movement of the occiput is the more readily promoted by this influence, because the perineal eminence is elastic, and glides up behind the head when the latter is pressed down upon it with force, and, being behind it, urges the occiput forward. M. Cazeaux believed that the perinæum was the sole agent causing the spiral change in the vertex position of the head, while other authors attribute the entire effect to the shape of the pelvic curves. But when the head is large in comparison to the size of the pelvis, the spiral change takes place too late to be caused by the perinæum. It is not complete in such instances until the head presses very heavily on the perinæum, causing it to pout out beyond its ordinary level on the side where the occiput is riding with painful friction over the bones. If, on the contrary, the head is comparatively small, the spiral change is perfected before it sinks deep enough for the occiput to be received entirely under the arch of the symphysis, and in this case the turn is produced by the perinæum alone, the diameters of the bony pelvis not interfering with it so high up. Before the spiral change is complete, extension of the cervix of the fœtus begins, at first slight. At the time the occiput is turned forward under the symphysis the chin has departed from the chest; the face, or rather the forehead, is in the hollow of the sacrum, and henceforth, until the head emerges from the soft parts, extension is the most important item in expulsion. The occiput cannot be pressed forward, nor elevated sufficient to permit expulsion, unless the neck is extended from the body as forcibly as it was flexed upon it before the beginning of labor. So also we cannot consider the extension complete until the head is expelled. It is interesting to follow the effect of the application of uterine force in effecting these changes. The spiral is effected by the antagonism of the short bilateral diameter of the pelvis between the spines of the ischium, with the diagonal diameter of the head embraced by it, urged onward by the uterine force. The uterine action only presses the head down in a direction corresponding with the uterine axis, or posterior part of the sacrum, the spines of the ischium turn the occiput forward, and this last is pressed obliquely downward by the force acting more upon its posterior part. After the head is turned, with the occiput forward, the great bulk of it lies behind the neck, which is applied close to the symphysis pubis.

The uterus continues to act in a direction of its own axis, but instead of the head receiving an application of the force at the centre of the pelvic excavation, in consequence of the column of neck-bones being within the anterior fourth of the pelvic circumference, the power is applied as if to the fulcrum of a lever with one short and one long end, the longer end being behind and the shorter end before and under the symphysis. And we should recollect, further, that the short end of the lever is free, and the force is imparted to the long end of the lever in the posterior part of the pelvis. The hollow of the sacrum, as an inclined plane directed downward and forward, gives direction to the head under the force acting thus obliquely backward, causing the short end of the lever to be elevated and the long to be depressed, the occiput being elevated before the symphysis and the forehead being depressed beneath it. This extension of the head is made, therefore, by the application of the uterine force through the bones of the neck. The changes wrought by the extension are to apply the face to the hollow of the sacrum, cause it to sweep over the whole lower part of this portion of the bone, over the sacrum and perinæum, pressing before it this distensible assemblage of soft parts in a flat thin layer, into the posterior part of which the floating coccyx enters, partaking of all its movements. The forehead first stretches the perinæum, drawing the anus wide open to permit of the requisite amount of yielding tissues. The perinæum, thus spread out and rendered very thin, is expanded sufficient to permit the whole head to pass between it and the arch of the symphysis, the diameters of the opening thus allowed being equal to the diameters of the pelvis. When the perinæum is firm, it holds the head closely up to the symphysis, and does not begin to slide back of the head until it has been pushed forward so as to be nearly or quite upon a level with the symphysis, as the woman lies upon her back. At length, after this great expansion, in which the head in some primipara cases seems to be outside the pelvis and embraced by the perinæum, some of the anterior fibres suddenly give way, and a recession is the rapid result, leaving the head free and entirely expelled from the pelvis and soft parts. After the head is expelled the face turns diagonally backward toward the sacro-ischiatic synchondrosis, to which it was applied before the spiral change began. A continuation of the expulsion brings down the shoulders. As they press upon the bottom of the pelvis the one nearest the symphysis is thrown forward and engages beneath the arch. If the perinæum has been much torn, the shoulders will pass without resistance; but if not, they will be arrested for a short time, the shoulder under the symphysis merely appearing, while the body is bent laterally up around the symphysis, and the other side is sweeping over the lower part of the sacrum and perinæum until the lower shoulder fairly passes, when both are pressed outward together and the arms are expelled. After this the parts are so distended that there is not any distinct mechanism, the abdomen and hips passing very readily.

The placenta is next expelled from the uterus in the direction of its axis, and lodged in the hollow of the sacrum, where it remains for a greater or less time—from a few minutes to a number of hours. At length, through the action of the abdominal muscles mainly, pressing the uterus down upon the vaginal and perineal, it is expelled, turning up under the pubis and over the edge of the perinæum.

This is a general description of the mechanism of labor, as we shall witness it in most cases that pursue a natural course. The different positions of the fœtus cause some special modifications that require particular attention. We shall also find that the presentations of other portions of the head besides the vertex, and even of the breech, are governed by the same general rules of change as they pass through the pelvis; and this study will enable us to comprehend these varieties very readily, and classify them in an analogous manner. In fact, there is so close a similarity between the modes in which the face and the breech presentations are managed by nature, that we are enabled to adopt almost the same classification in reference to their relation to the parts of the pelvis.

I shall therefore proceed to describe the difference in the mechanism or mode of delivery in the different positions of the vertex, afterwards those of the face, and finally of the breech. The first position of the vertex,—with the occiput to the left acetabulum, and the forehead to the right sacro-iliac synchondrosis,—as has been said, is the most common, and its mechanism very much the most simple and the delivery easiest (Figs. 85 and 94).

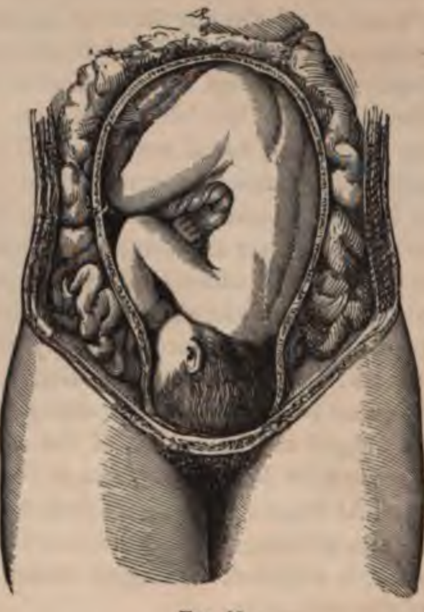


FIG. 93.

The spiral change is from left to right until the forehead and face are in the sacral cavity and the occiput under the symphysis pubis (Fig. 95). The head makes only one-eighth of the circuit around the pelvic circle, from the acetabulum to the symphysis. The changes that occur in the position of the vertex in the second position are very much greater. The occiput is at the right sacro-iliac junction, and the forehead at the left acetabulum (Fig. 86). In this position the spiral changes and direction

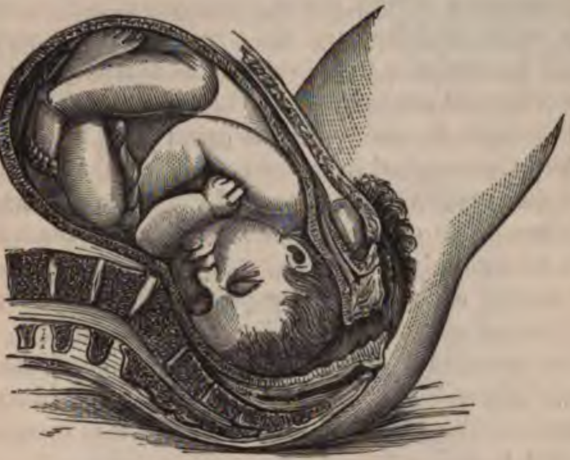


FIG. 94.

of the diameters of the head are reversed from what they were in

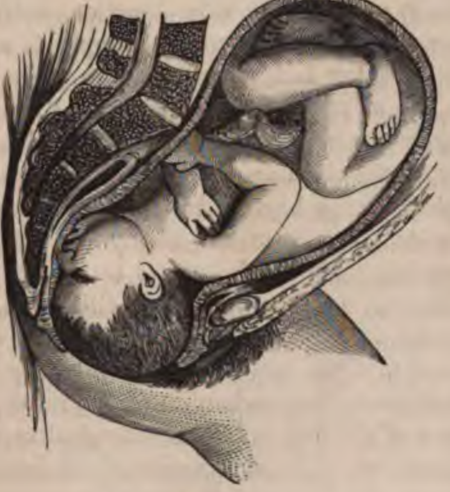


FIG. 95.

the first position. While this is now regarded as the most common, next to the first, it was formerly considered to be very rare. This mistake was committed by the older writers, because they believed instances in which the face came out under the symphysis were the only examples of this position, whereas it is now understood that this mode of delivery of the presentation is a very uncommon fact; an exception to the rule. The discovery of this deviation from the old explanation of the mechanism of labor first induced Naegele to undertake his painstaking investigations on the subject, that resulted in the reversal of many notions that had obtained the sanction of great authority and been entertained for a long time. The change of the vertex in the second position amounts to three-eighths of the pelvic circle in extent. The occiput sweeps around from the posterior lateral to the anterior central portion of the pelvis. The spiral movement commences when the vertex is low enough to touch the spine of the ischium, whence it glides forward on the plane of the ischium down to the ramus, and from this point the change is soon completed, and the occiput is under the symphysis pubis, when extension takes place and delivery is effected as in the first position.

In the first position the face and abdomen are directed backward and slightly to the right. The right shoulder enters the pelvis behind the right acetabulum, and the left at the left sacro-iliac junction. They continue in this direction until the head is expelled, when the right turns to the symphysis and remains at the arch until the left is expelled, when they are both together protruded so far as to permit the arms to fall out, generally the left first, but sometimes the right. In the second position the face and abdomen of the child are directed anteriorly and to the left. When the spiral change begins, the right shoulder soon turns to the right side of the sacrum, and finally gets fairly to the right sacroiliac junction, while the left turns to the left groin. They descend in this way until the head is expelled, and then the right shoulder returns to the hollow of the sacrum, while the left appears at the symphysis, and the rest of the body is delivered as in the first position. The mechanism of the third position is precisely like that of the first, only that the spiral movements are in the reverse direction. The movements of the fourth are like the second reversed. In the occipito-posterior positions sometimes, though comparatively rarely, the forehead turns under the symphysis pubis and the occiput glides over the perinæum, as represented in Fig. 96. It would seem difficult to account for the very great change that takes place in the direction of the head in the second and fourth positions of the vertex, if we were not to recollect that the long plane of the head is opposed to the shallow portion of the pelvis, and hence that the occiput touches the spine of the ischium before so much of the head has descended into the pelvic cavity as in the first and third positions, and consequently is not so soon fixed.

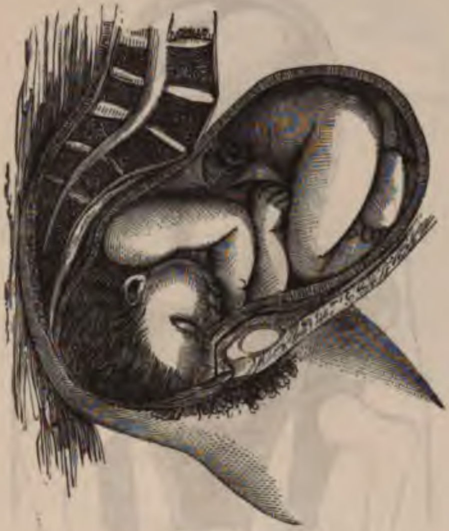


FIG. 96.

FACE PRESENTATIONS.

Other parts of the head present themselves besides the vertex, the most common of which is the face. All that is necessary to convert a vertical into a face presentation, is to forcibly extend the head upon the neck, or separate the chin from the chest before the head descends into the pelvis. And there can be little doubt but that this is the manner of occurrence in face presentations, at least quite often. In studying the mechanism of this sort of presentations, it is usual to divide them, as in vertex presentations, into four. The first is where the chin is at the left acetabulum, the forehead at the right sacro-ischiatic junction;

the second the reverse of this; the third, with the chin to the right acetabulum, and the forehead at the left sacro-ischiatic junction; and the fourth the reverse of this. The diameter of the head thus engaged is fronto-mental, and is less than the

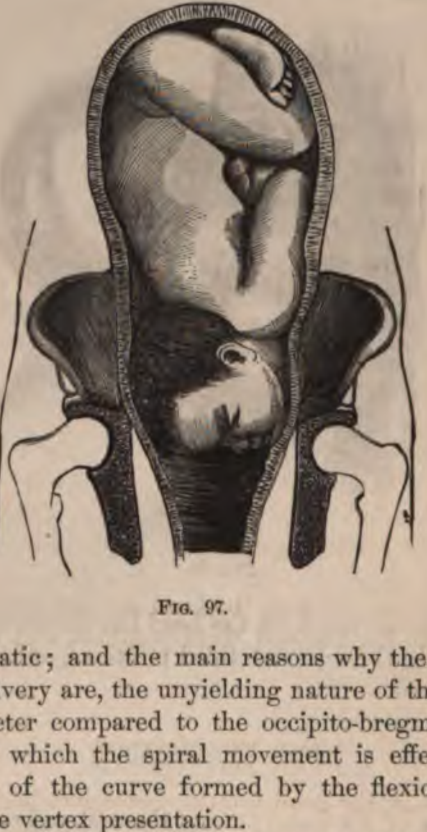


FIG. 97.

occipito-bregmatic; and the main reasons why the face is more difficult of delivery are, the unyielding nature of the bones forming this diameter compared to the occipito-bregmatic, the less readiness with which the spiral movement is effected, and the greater length of the curve formed by the flexion as against extension in the vertex presentation.

The mechanism of face presentation in the first position is the simpler, and may be studied first. The chin descends behind the left acetabulum, and the forehead next the right sacro-iliac junction, until this last is arrested by the spine of the right ischium, and the chin impinges upon the plane of the left ischium, when its forward movement causes the forehead to turn into the hollow of the sacrum, while the chin is turned into the ischio-pubic arch, and finally under the arch of the symphysis (Fig. 98). Soon as it has arrived at this point the posterior part of the head begins to descend, and the neck to be flexed; the chin rides up around the symphysis, and approximates the breast. The chin does not depart from the symphysis until the head, descending along the hollow of the sacrum over the coccyx and perinæum, is expelled from the vulva, with the chin pressed hard against the symphysis pubis. The limbs and body of the child are flexed in the same manner as in vertex presentations, and the mechanism of delivery of the body is the same, and consequently need not be described in this place.

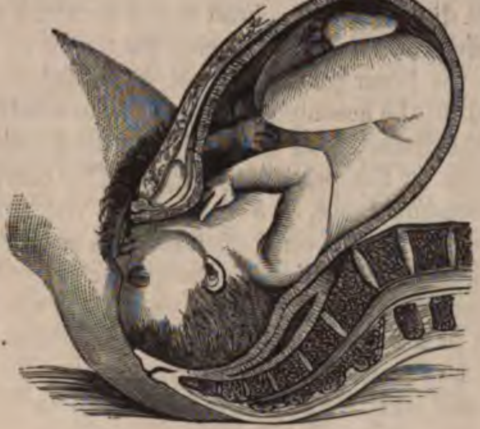


FIG. 98.

The mechanism of the second position of the face is quite different from that of the first. The head sinks down into the pelvis, with the forehead to the left anterior part of the pelvis, or behind the left acetabulum, but changes in passing down, so that the chin attains a position anterior to the spine of the right ischium, and the forehead is carried behind the left ischiatic spine, and the spiral change thus initiated is continued until the chin appears under the arch of the symphysis from the right side, and thenceforward the mechanism resembles the latter part of the process in the first position. The third position is like the first, only the chin is situated on the opposite side of the pelvis, and the mechanism resembles it, except that the movements are in the opposite direction. The fourth may be likened to the second, and differs from it in the mechanism of delivery only in moving in the opposite direction. It will be seen that in face presentations the occiput does very seldom, if ever, come out under the symphysis pubis, but in all instances glides over the perinæum. Indeed it is conceded on all hands that a labor with face presentation, the mechanism of which would bring the occiput to the symphysis pubis, would be impracticable, because the fronto-mental diameter of the head would be added to the thickness of the chest and shoulders during the transit of the presenting through the lower part of the pelvis and inferior strait. In no case could this be accomplished without the condition of great disparity in the diameters of the pelvis and head—when the head was very small or the pelvis very large. The exception might occur in premature labor, or a child with a very small head. I cannot but remark in this connection that the exact agencies, and their mode of operating in causing the spiral changes in the different face presentations, are not so well understood nor so plausibly explained as in the vertex presentation. Deviations from vertex presentation less marked, yet more troublesome than face, are occasionally met with. As the head descends in the pelvis the chin departs from the chest, until the brow or lower part of the forehead is the most dependent. The diameter of the head engaged in brow presentations is the corono-mental, longer than

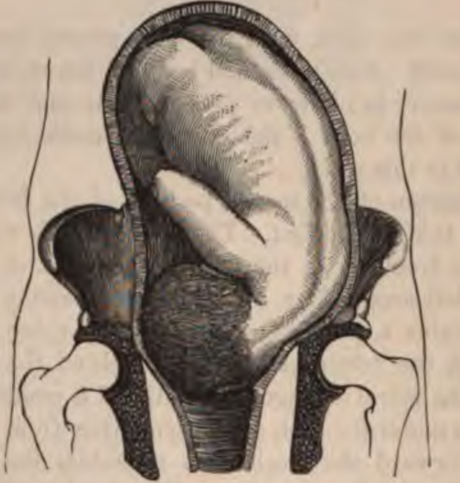


FIG. 99.

the fronto-mental, and quite as unyielding to pressure. Fortunately this is generally converted into a face presentation, and falls into the mechanism described for it. The side of the head (Fig. 99)—called ear presentation—is observed to present very rarely, but it is mostly converted into vertex presentation, and terminates naturally.

BREECH, KNEES, AND FEET PRESENTATIONS.

The nature and mechanism of the presentations of the different parts of the pelvic extremity of the fœtus is so completely the same, that it will only be necessary to give a general explanation of it in connection with all of them. In the case where the breech presents, the natural flexed condition of the whole fœtus exists as in the vertex (Fig. 100); when the knees or the feet precede it, the limbs are extended, and in this respect they differ from the presentation of the breech in the same way that the face presentation does from the vertex. The relations between the fœtal and maternal parts—so far as diameters are concerned—are very nearly the same as in presentations of the cephalic extremity of the fœtus, and are arranged by writers very much in the same way. Four modes of presentation are recognized: first, with spine of child applied to the region of the left acetabulum of mother, with the face looking to the right sacro-iliac synchondrosis; second, the spine of the fœtus applied to the right anterior part of the maternal pelvis, with its abdomen turned to the left maternal sacro-iliac synchondrosis; third, the abdomen of the fœtus to left anterior portion of the mother, with the dorsum of the fœtus directed to the right sacro-iliac synchondrosis; and fourth, the abdominal surface of the fœtus looking to the right acetabular region of the mother, with its sacrum toward her left sacro-iliac synchondrosis. The mechanism of the first and second positions is more simple than the third and fourth, and one description will answer for them, remembering that the movements in the second are the reverse in direction to those of the first.

When the breech is within the pelvis in the first position, it sinks down to the perinæum in the direction in which it entered, with the sacrum of the fœtus at the left acetabulum. So soon as it commences to press strongly upon the perinæum, the left hip begins to turn toward the pubis, and as it attains the lower strait this part shows itself under the arch of the symphysis, and then advances quite slowly, while the right hip—which has glided into the hollow of the sacrum—distends the perinæum, and is urged forward until it emerges from the vaginal orifice, at the same time that the left hip has also fairly cleared this opening (Fig. 101). The left hip in this process is not so completely stationary at the symphysis as the occiput is in the first position of that presentation, but it remains comparatively fixed, while the right advances with more rapidity. After the breech has been expelled the abdomen of the fœtus looks diagonally backward and to the right, while the back looks forward and slightly to the left, showing that the portion of the fœtus contained in the uterus has not turned. The body is expelled in this position, being somewhat bent by the perinæum laterally toward the pubis. The shoulders enter the pelvis in the same manner as the hips, the left to the right groin of the mother, and the right to the left sacro-iliac synchondrosis. They turn at the bottom of the pelvis, so that the left comes out under the symphysis, while the right glides over the perinæum, the right arm dropping out usually first, although such is not always the case (Fig. 102). The head enters the pelvis before the shoulders are

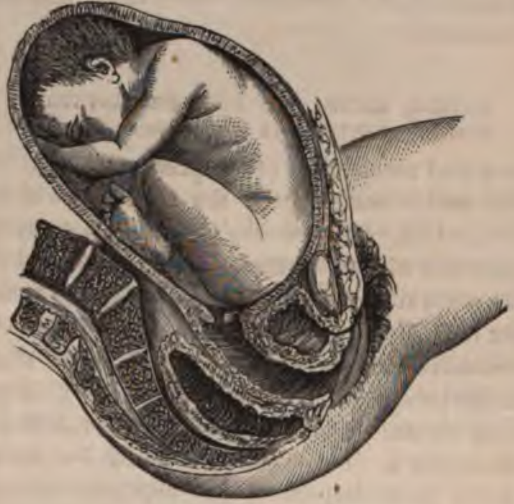


FIG. 100.

expelled. It comes with the face looking downward, and toward the right sacro-iliac synchondrosis, and with the occiput upward and toward the left groin. Sinking down into the pelvis, the chin and face come in contact with the perinæum and turn back into the hollow of the sacrum. The occiput sinks down to the arch of the symphysis, and remains fixed behind, while the face, forehead, and top of the head pass over the perinæum, when all emerge from the vaginal orifice together. The arms should remain flexed

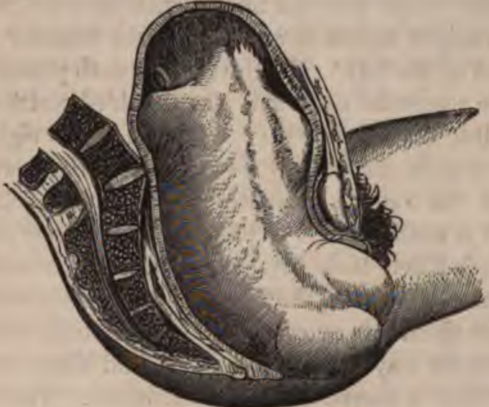


FIG. 101.

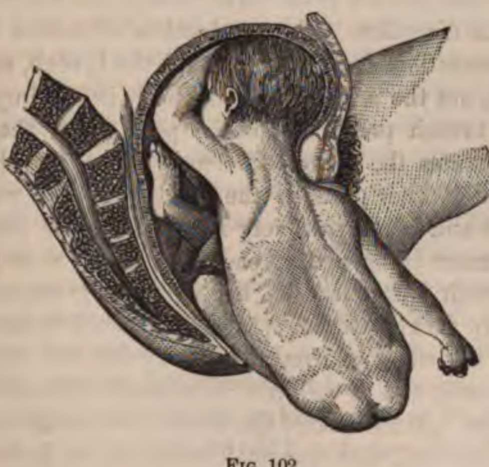


FIG. 102.

on the chest, and the chin well and closely applied to the sternum, until they drop out of the vagina. In the second position the spine of the child is at the right groin, and the abdomen looks toward the left sacro-iliac junction, the right hip is turned to the symphysis, and the left to hollow of sacrum. All the steps of delivery are the same, except that the movements have the reverse direction. The occiput comes down in the right anterior part of the pelvis instead of the left. The third and fourth presentations have a mechanism somewhat different. In the third position the breech is intruded into the pelvis with the sacrum to the right sacro-iliac junction, and sinks down until it comes in contact with the perinæum, when the right hip rotates to the pubis, and remains in contact with it until the left is passed over the perinæum, ready to be expelled, when both hips are at about the same time extruded. The abdomen of the fœtus now looks forward and to the left, until the shoulders engage in the lower strait, when the right shoulder finds its way to the symphysis, and there remains while the left shoulder is passed over the perinæum. The head enters the pelvis with the face downward, and at the left acetabulum, but during its transit through the cavity turns into the hollow of the sacrum, and the occiput rotates under the symphysis and is expelled as in the first and second positions. The fourth position has the same mechanism as the third, except that the fœtus rotates in the opposite direction. The mechanism of labors with knees and feet presentations is the same as of the breech, as has been before stated, but the process of labor varies in one important particular. In breech presentations the passage of the breech is slow, but it dilates the parts sufficiently to permit of the rapid transit of all the other parts of the child. In knee and footling cases the feet and knees pass very readily, but the parts are not dilated, and must be opened by each part as it comes to the outlet. The breech dilates it some, the shoulders more, and the head still more. In fact the fœtus, when thus extended, has the shape of a wedge, the small end represented by the feet, and the large end by the head, and it requires continually increasing force to urge it through. In the case of the breech, the fœtus assumes more the shape called oval, with the small end down, to be sure, but the disparity between the two ends is not so great, and consequently the latter part of the first stage of labor is delayed a much less time than in the footling presentation. The importance of this difference will appear very readily when we reflect that a detention of the head in the pelvis for even a few minutes is sufficient for its destruction. Breech presentations have variations as well as the head, and consequently in large pelvis or premature cases the presentation does not follow the above rules in reference to spiral changes, nor is the mechanism strictly observed even when the presentation is regular, the face coming out in front, and the occiput behind.

DIAGNOSIS OF LABOR.

It is usual and proper to inquire of the nurse, or patient herself, whether the time for confinement has arrived, how long since the symptoms were first observed, and what were the first symptoms; how frequently the pains come, and what their character; satisfying ourselves, as near as may be done from this manner of inquiry, whether labor has begun, and about the progress and stage. But we cannot arrive at any positive information in this respect without physical examination. We should commence this by observing the manner of the patient, her position and movements, whether she complains as if the pains were severe, and whether she tries to aid them instead of shrinking from their effects, etc. If the symptoms are not urgent we may thus spend a few moments, or even an hour, in assuring ourselves of the condition of the patient from such evidence; but if the symptoms are active, and the patient seems somewhat advanced in labor, we should lose no time in proposing an examination by touch. The nurse will sometimes understand all that is requisite, and make the proper preparation for it; but if not, the directions should be given by the practitioner. When the woman or her friends find labor approaching, they prepare the bed for it, and it should be the bed upon which the patient can lie for twenty-four hours, instead of a more temporary one, as it is often very important that she be not removed for that length of time. I think it is better that the patient be confined on the bed she intends to occupy until she is done with the lying-in condition. It is prepared for labor by being protected from the discharges of liquor amnii, blood, and excretions. Two or three thicknesses of blankets, comforts, or quilts are placed across the bed, extending from one side to the other, one of which is india-rubber, and over this an ordinary sheet is placed. It is also a good plan to have a doubled quilt or blanket placed on this more permanent protection, to be replaced after labor is over, that the patient may be rendered more comfortable. Soon as active labor has begun, and it is necessary for the woman to remain in bed, she should be dressed as for bed, so that her clothing may not need to be changed for some time after labor is over. The position which the patient should assume to undergo the examination ought to afford complete facility for the use of both hands, the right for the internal and the left for an examination of the abdomen. The best for this, I think is, by all odds, the dorsal decubitus, near the edge of the bed, with her head to the left hand of the attendant as he stands facing the bed, with the shoulders elevated and the limbs flexed. The accoucheur should be furnished with some kind of bland oil, as olive oil or lard, and a towel or napkin. Seating himself by the side of the bed, opposite the hips of the patient, he is ready for the examination. For this purpose he oils the index and middle fingers of the right hand. The hand should be placed under the cover, beneath the limbs of the patient as they are flexed, and after having reached the genital organs the index may be gently inserted into the vagina. If it fails to reach, in a satisfactory manner, the whole of the presenting part, we should introduce both fingers. We are directed by most authors to introduce the finger during a pain, and make an examination after it has passed away; but in this I think we must be governed by the convenience of the patient and ourselves. However we may do this part of it, we will fail to get the most information unless we allow the fingers to remain, in the act of examination, both during pain and in the interval. If labor is just beginning, and the presentation is vertex, after the finger is fairly introduced it will come in contact with a round firm body that prevents it from passing upward, except in contact with the pubis or other part of the pelvic wall. It seems to fill up the whole pelvic excavation. Upon a careful survey of this rounded body it will appear covered with a soft thick membrane in every direction, while at the most dependent portion, or perhaps a little behind it, somewhat toward the sacrum, is a depression large enough to allow the finger to sink into it, and at the bottom of this depression the tumor is much more solid; in fact, the finger recognizes the fact of being in contact, or very nearly so, with bone. This round substance, so completely filling up the pelvis, is the vertical part of the head, the thick covering the uterus, the depression the os uteri, and the hard bony bottom to it the skull, covered with the scalp and thin membranes. If we examine the os uteri a little more closely, by pressing the finger into it, we will feel and be able to elevate the labia, now stretched into a round ring, and if the finger is held in this ring-like depression during a pain, we will perceive its edges to become firm at first, and after remaining so for a very short time to relax and dilate somewhat. Other circumstances we may note are, that first the region around the os appears to be pouted downward; the membranes, lying apparently on the skull before, are now separated from it, and the head is felt through a layer of water. After the pain has subsided the parts all assume their former condition. At first these changes produced by a pain are slight, as the pains are moderate; but, as labor advances, the os uteri becomes larger, the membranes protrude and form a projecting bag, tense to the feel during pain, and relaxed after it goes off. As this goes forward the head is crowded down lower,

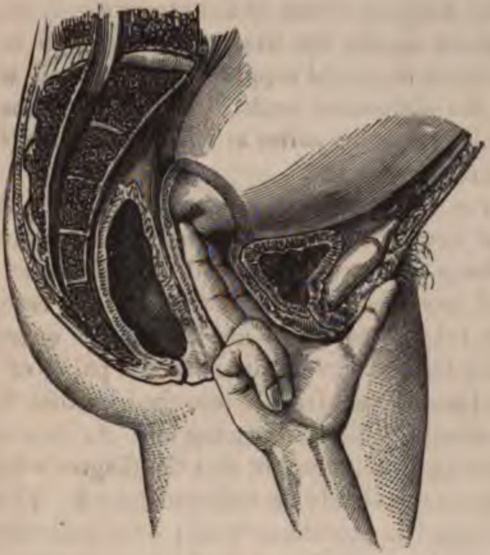


FIG. 103.

the membranes break, and the waters are discharged, and the first stage is accomplished. The left hand, placed on the abdomen at the time we are examining internally with the right hand, will feel, in the absence of pain, the irregular globular tumor formed by the uterus, and very plainly the outlines of the parts of the fœtus. When the pain comes on the uterus slowly becomes hard, and when at its height the whole uterine globe is very hard, feeling as firm as we would suppose a wooden ball would feel if covered by the abdominal walls. It continues thus firm for a time, gradually becoming softer at its lower portion, the hardness subsiding at the fundus last.

In this array of circumstances constituting labor, the pains are the essential item; hence women consider themselves in labor when they have pains recurring as described under the head of symptoms of labor, but such is not always the case. They are occasionally subject to what are known as *spurious pains*, because while they so closely simulate the pains of labor as to deceive the patient and friends into the idea that this process is initiated, nothing of the sort is going on. As they cause a great deal of suffering, it is important that the diagnosis between them and real labor pains should be well understood. These pains are not often situated in the uterus itself; sometimes they are in the alimentary canal, especially and perhaps more frequently in the rectum; at other times they are in the abdominal muscles, and occasionally in the lumbar muscles, but they are sometimes also in the uterine muscles themselves. They differ, of course, in character as well as position. When the pain is in the rectum it assumes more the tenesmic character of pains belonging to the second stage, and when in the bladder something of this kind of tenesmus is experienced. When higher up in the intestinal canal it is more diffused over the abdominal region, and like the pains of the first stage. It is, in fact, colic. When the pain is in any portion of the intestinal canal, there is almost invariably associated with it more or less intestinal irritation, generally slight diarrhœa, with vitiated stools or dysenteric phenomena. If in the lumbar muscles, there is more or less trouble in moving, having more or less lameness in the back. If in the abdominal walls, there is ordinarily tenderness upon pressure over some part or the whole of their extent. In these muscles, or in those of the back, there is actually rheumatic inflammation. There are many instances of these spurious pains in which the attendant symptoms will not enable us to decide with any positiveness as to their character, and hence it becomes necessary to resort to physical examination. In all the localities I have mentioned the pains do not affect the uterine fibres—there is not uterine contraction. If, therefore, we place our hand on the abdomen externally, the abdominal walls will harden under our touch, but the uterine globe remains flaccid. Upon examining the lower segment of the uterus through the vagina, the first thing to note is whether the cervix is entirely developed, or whether there is not more or less of a nipple-shaped projection of the cervix where we ought to feel the depression I mentioned, thus showing that gestation is not complete, and consequently that there ought not to be uterine contraction. Or, if the cervix has disappeared, and we can feel the depression or patulous os uteri, it continues the same during pain instead of contracting, or rather hardening and expanding. The membranes are not affected by it either. There is almost always some discrepancy in the pains as compared to real labor pains,—the bearing-down pains commencing the attack instead of being preceded by pains of first stage; or they are irregular as to time of intervals, sometimes there being only five minutes between them, while at others there is an interval of half an hour or even more, and with this irregularity there is as much difference in the strength. Or one pain is such as we observed in the second stage, and then it is succeeded by such as are observed in the first. The pains are essentially irregular in force, frequency, and duration. But, as I have before intimated, the pains are sometimes located in the uterus, and there is true uterine contraction. I remember instances in which there was irregular uterine contraction, the os uteri was open enough to admit the finger, the membranes tense, and watery discharge from the vagina, and yet labor did not occur. In some cases these evidences of commencing labor are very decided and yet subside. The treatment for all these forms of false pains is such as is calculated to relieve the conditions upon which they depend. Opium in some form, in pretty decided doses, will be necessary in most of them; fomentations to the abdomen where the abdominal muscles are affected; venesection in plethoric cases, and attention to the state of the bowels. Although a laxative injection first, if the bowels are at all constipated, followed by a few doses of opium, say fl ʒ ss. of tinct.

opii, succeeded by half the quantity every two hours, with fomentations to abdomen, will often effectively relieve these pains, yet in plethoric women it is very much better to bleed, and sometimes it is the only means of relief. In cases where the pains are truly uterine, and when the cervix is not entirely developed, no matter if it is dilated even an inch in diameter, so that the membranes are preserved, we should endeavor to relieve the pains, and this may often be done. Although this is a considerable digression, I hope the importance to the student of knowing something of this spurious labor will be a sufficient excuse. After satisfying ourselves as to whether labor has commenced, the next desirable information to be obtained by examination is as to what is the presenting part. We should be careful in this investigation not to rupture the membranes, and if the presentation is not much advanced we may, with propriety, simply find out whether it is head, breech, feet, knees, or some other part of the body. The vertex always enters the pelvis before uterine contraction fairly begins, when it is the presenting part, unless there is deformity of the pelvic brim, the head disproportionately large, or great obliquity of the uterus. Although last mentioned, obliquity is perhaps the most common cause of the head being detained at the superior strait. The vertex is not only already in the pelvis when labor begins, but it fills the whole circle of that cavity, is round and uniform, so that it is one rotund solid part that sinks lower in the pelvis than any other. The face is flat when felt from below, always high up in the pelvis in the commencement of labor, and also pretty uniformly fills the pelvic circle. Sometimes, though not often, before the mouth of the uterus is well open, and the membranes ruptured, we can distinguish the different features of the face. The breech sinks well into the pelvis, ordinarily, before the beginning of labor, when it is the presenting part, and generally fills the pelvis in all directions; yet if we press the finger on any four opposite points—at the sides of the pelvis—of the presenting part, in some one or more of the points we will find soft tissues instead of all bony as in the vertex; for this experiment with the vertex will show four points of solid bone when the knees present. If they are both together, it will not be difficult to distinguish them from any other parts, as there are other two substances that will very closely resemble them. One can ordinarily be known by the patella as distinguished from the olecranon with which alone it is likely to be confounded. The feet if both are felt; this fact is almost conclusive, as both hands very seldom present at the os uteri together, and if one of the feet and one hand are together, our diagnosis is sufficient, for our object is to learn, at this stage of labor, whether the presentation is practicable. What I regard as a valuable item in our diagnosis of these small parts—hands, feet, knees, and elbows—is their lightness or mobility. The knees are pretty firmly pressed downward, constituting the main part of the presentation, and consequently, although movable, sometimes easily, they are very much less so than the elbow; so we may compare the feet and hands, the latter being more mobile than the former. In addition to these signs we may sometimes, very early in labor, be able to decide that we have not a vertex presentation by the shape of the bag of membrane that advances before the part. In vertex presentation the bag of water is more globular in form than in other presentations; in breech cases this form is very nearly imitated; in face and shoulder presentation it is long and slender comparatively. I have observed so many exceptions to this rule, however, that I have ceased to consider it anything like positive in its indications. When the vertex is detained high up in the brim of the pelvis, and the bag of water projects much beyond it, the elongation is apt to become quite evident. We can by a careful consideration of all these marks determine, before the os uteri is fully opened, and before the rupture of the membranes has taken place, whether there is a cephalic or pelvic presentation, or some other. After the cervix is fully open, and the membranes ruptured, we are to determine with precision the part presenting, and its position in the pelvis. The diagnosis of the second stage is so much more easy and complete because the part is uncovered, and has generally approached somewhat, and sometimes very much nearer the outlet of the vagina, and may be explored throughout its whole extent by two, if not by one finger. Where there is an exception to this rule, sufficient of the hand may be introduced to satisfy us, if there is any doubt about the presentation or position being a practicable one. If we are sure it is practicable, we ought not to be so urgent in our efforts at diagnosis as to give our patient unnecessary pain. The features of the vertex I have already given are much more evident in the second stage; it is round, almost uniformly hard throughout, except the small portions where the fontanelles are situated, and this firm bony tumor fills up the pelvis, so that if we press our finger strongly against it at any part, we feel no soft part; this is not the case with any other part, except perhaps the brow, if it is so in that. The vertex is traversed in more than one direction by the peculiar ridges formed of the overlapping edges of the sutures. There are three kinds of marks by which we may determine the position of the occiput in the vertex presentation. The first is by the vertex itself. If we remember that the vertex is the foremost portion of the presentation, that it is very near the occiput, and that the occiput is in contact with the wall of the pelvis, we will seldom be at a loss to at once distinguish between the positions of the presentation. When the most dependent part approaches nearest to the side of the pelvis it is the vertex. In the first position the most dependent portion of the presentation is within about an inch of the pelvic wall, behind the left acetabulum (Fig. 104); in the second position of the vertex the most dependent part of the presentation is within about an inch of the right sacro-iliac junction (Fig. 105). In the first,

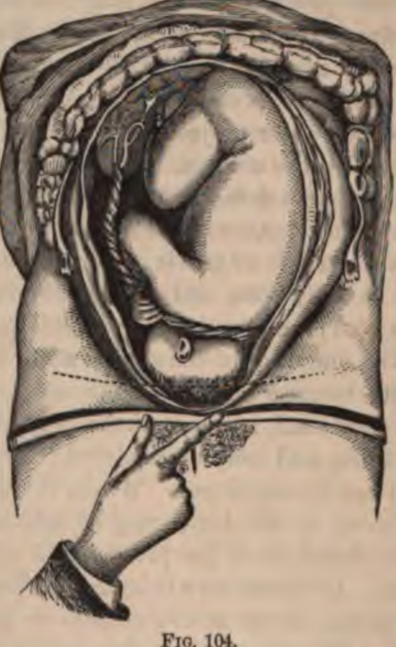


FIG. 104.

the highest point of contact with the pelvis is at the right sacro-iliac junction—by the frontal bone; in the second position the highest point of contact is at left acetabular region, and by the frontal bone. This statement of the relative positions of the parts obtains only before rotation has begun. But the rule that the vertex is the foremost part, and will always be sufficiently obvious to guide us in our diagnosis throughout all the changes, is true in a great majority of instances. The second is the fontanelles and the sutures. We must remember, and bear well in mind the position of these, with reference to the vaginal opening. The fontanelles look downward in the central part of the pelvis, and consequently are remote from the point where the finger enters it. In fact, in the first position of the vertex the finger, upon being introduced, comes in contact with the posterior part of the parietal bone not far from its vertical centre, consequently, to touch the great fontanelle the finger must be passed down beneath the presentation, and across it to the centre of the

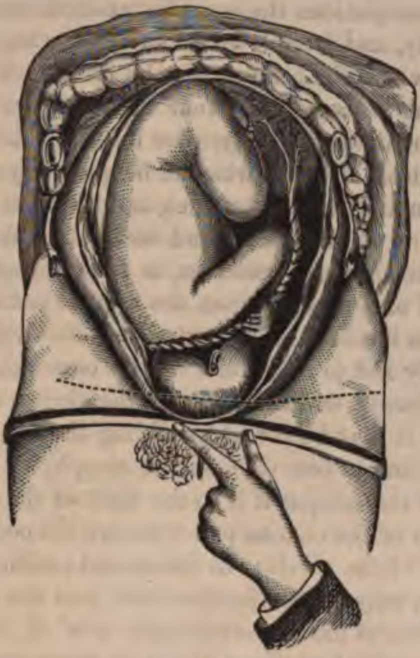


FIG. 105.

pelvic cavity; to find the lesser fontanelle, the finger must be passed under the centre of the presentation, and then glided toward the pelvic wall, very near which it will be found at the left anterior portion of the pelvis. I have already described the fontanelles in speaking of the fœtal cranium. In all the positions of the occipital presentations the great fontanelle is near the centre of the pelvic cavity, and from it we may trace the sagittal suture toward the side where the occiput is to be found. The sutures are lost in the great fontanelle, all four of its angles receiving one each. In like manner the sutures are lost in the lesser fontanelle, in its three angles. These marks will be generally sufficient to enable us to distinguish the fontanelles, and by them the position of the vertex. The student will find more difficulty in reaching than in recognizing these openings, as they, especially the great one, are a good finger-length from the vaginal entrance. But the third, and I can but feel an easy mark of distinction, is the ear. We can scarcely fail to reach one of the ears behind the pubis. It is almost always within reach of the finger during all the second stage. It may be found by sliding the finger up to its full length behind, and to one side of the symphysis pubis. In the first position of the occiput it is to the right of the symphysis, and the free portion of the concha points toward the occiput, or the anterior left side of the pelvis; in the second position the ear is in the same place, only a little further back, and the free portion of the concha points to the posterior right side of the pelvis when the occiput is to be found. All that is necessary is to bear in mind the fact that the free portion of the concha points to the occiput, in order to fix the position of the presentation at once.

DIAGNOSIS OF FACE PRESENTATIONS.

The face comes down slowly, and the second stage often finds it high up in the pelvis, and it will be necessary to introduce two fingers in order to get a fair examination of it. The features are so plain and obvious, when completely uncovered by the full establishment of the second stage, that we can generally make out the position of the presentation unmistakably. The mouth, with the gums, tongue, and lips, are unlike any thing we are likely to meet with beside, and it is only necessary to remember that it is within less than an inch of the chin, to get a good idea of the presentation. It is impossible to mistake the mouth for the anus, or the converse: the presence of the bare gums is distinctive. The nose, eyes, and superciliary ridges may usually be made out with distinctness enough to be quite positive also. I need not repeat the order of the positions of face presentations. The chin was taken as one of the relative points. The breech is also easily distinguished in the second stage, and the sex will to some extent govern the facility with which the position of the presentation is determined. If it be male, the relation between the genital organs and the anus will always be a sure guide as to the direction of the back; but if the fœtus is a female this will not be so easy, because of the similarity between the anal and vaginal opening. The legs are generally so strongly flexed upon the abdomen, too, that we cannot easily trace the genital sulcus to the division between the thighs. This is, nevertheless, the surest and most practical way of arriving at our diagnosis. The two fingers should be introduced up by the side of the presenting part, along the pelvic wall, in four or five different places, and they will scarcely fail to pass between the legs somewhere. When the intercrural sulcus is distinctly made out we can no longer be at a loss about the position of the presentation. In the second stage the knees can be recognized without any difficulty by the patella and their size. They press lower down in the pelvis in the direction of the face of the child. In the first position, or with the back to the left anterior part of the pelvis, the knees are near to the right sacro-iliac synchondrosis; but if this is not sufficiently obvious evidence we should trace the leg to the foot or the thigh to the body. The feet are also easily recognized, and the heel points in the direction of the occiput, and the toes of the face. Very much may be learned by a careful external examination of the abdomen with the hands. A little practice will enable us to distinguish between cross presentations and head or breech. The shape of the uterine tumor is very different in a shoulder presentation as compared to a longitudinal position of the fœtus. In the cross position of the fœtus the uterine tumor is broader than in the longitudinal, and does not extend to the ensiform cartilage, and in some cases not much above the umbilicus. But the head, legs, and breech can generally be distinguished, and the student will do well to educate his sense of touch in this respect. I find that by pressing the right hand fingers strongly into the lower part of the uterine tumor, while the upper part is seized with the left hand, and a rotary motion given to the fœtus, the head is more easily distinguished. We should feel all across the tumor from side to side, trying to pick up the legs, and we will generally find the knees and legs. The legs are, of course, directed toward the face. If the head is above, the left hand will easily detect it when rotary motion is imparted to the fœtus, and the legs will be discovered below by the right hand. We may better determine the position of the fœtus by external examination just before labor begins, before the head has entered the pelvis, and during the first than the second stage of labor. Our external manipulations for diagnosis should all be done between pains.

Auscultation is also a valuable means of diagnosis in determining position and the number of fœti in the uterus. Before labor, and anterior to the subsidence of the head within the pelvis, the heart is more distinctly heard to one side, and slightly above the umbilicus ; after it has sunk into the pelvis, it is below this point on the abdomen. If the heart is heard to the left of the umbilicus, the occiput is at the left side of the pelvis; if to the right, the reverse. If there are twins, one of the hearts may be heard a little above and on the opposite side of the abdomen from the other.

DIAGNOSIS IN THE THIRD STAGE OF LABOR.

By examining the uterine tumor we may determine whether the placenta has been expelled into the vagina. If the uterus still contains the placenta, it will be globular in shape and extend up to or above the umbilicus ; but if it has expelled it it will contract down to midway between the umbilicus and symphysis pubis. If there is irregular contraction or hour-glass contraction, the uterine tumor will be elongated and narrowed from side to side. We may be made aware of the time of the separation of the placenta by a sudden gush of blood from the vagina. But this can be demonstrated only by vaginal examination. When the placenta is within easy reach of the finger it is expelled partly, if not wholly, from the uterus. After the completion of labor the genital organs should be examined, with a view to ascertain if damage has been done, and to what extent. We may introduce one finger into the anus, and thumb into the vagina, and try how near we can approximate them in order to ascertain the amount of perineal rupture. The placenta and secundines should be carefully examined also, lest there be left behind so great a part of them as to cause harm by their decomposition. The maternal or uterine side examined first thoroughly, we then look for the opening in the membranes whence the child issued, and gathering it up inspect its cavity, the general contour of the sac, etc. In this way we will ascertain beyond question when the integrity of the amniotic sac is complete, and whether the placenta has been mutilated.

PROGNOSIS CONNECTED WITH NATURAL LABOR.

This has reference to our means of judging of the duration of labor, the safety of the mother, and the safety of the child. But as the division of natural labor includes no hazard to the woman, that item does not present itself in this connection. The duration of labor depends upon many considerations, and the most important of them will be taken up separately and receive brief notice.

The fact of whether the patient is a primipara or multipara has much to do with the duration of the labor, for it may be regarded as almost universally true—other things being equal—that the woman will suffer more during her first than subsequent labors; the duration will be decidedly longer. And this increased length of duration extends through all the stages, each respectively lasting longer in the first labor than afterwards. Perhaps the most common exception to this rule is where a woman has borne one or more children in early life, and not again for ten or fifteen years or some other long period. But occasionally we meet with patients whose labors are all terrifically hard and of long duration. In these last the difficulty is caused by bony obstruction, on account of the small or badly shaped pelves, while in the first-mentioned cases the resistance is in the soft parts, and after having been once dilated by the passage of a child it requires several years, if they ever reacquire their former firmness. While in primipara all the stages are likely to be equally protracted, in the woman who has borne several children the first stage is likely to be disproportionately long, if there is delay. The prognosis, so far as the welfare of the mother is concerned, is materially affected by the stage in which retardation occurs. The first or dilating stage may be protracted very greatly without much damage to either mother or child; but if the second stage is of very long duration the mother's energies, and perhaps her tissues, will be in danger of damage. The same may be said of the safety to the child. The age at which the woman begins to bear children has been regarded as a cause of increase in the duration of labor, and consequently the risks of patient, and—Madame La Chapelle, Cazeaux, and others to the contrary notwithstanding—I think not without reason. My experience, of course, is very much less extensive than theirs has been, yet I can but give my testimony in favor of the old idea, that old primipara have more tedious labors than younger women. But quite young primipara are more likely to have labors of longer duration and more hazard than those of maturer age. We find many happy exceptions to this rule, both in the aged and in the young primipara. The most propitious time of life to begin childbearing, perhaps, is from twenty to thirty years of age. Temperament and habit of body have something to do with the duration of labor. The very nervous and timid patient is apt to have less efficient labor than the more quiet and courageous. Women of muscular make, who are strong and self-reliant, more generally have quick and easy labors, especially if they are of active habits. As general good health and strength increase the favorable chances in labor, so do bad health and great debility add to its dangers and duration. To both of these statements, however, we shall see many exceptions. In some women it would seem that during labor all their surviving energies were bestowed upon the uterus for the great purpose of the safe delivery of the children; while others, who have a surplus of strength for all other purposes, are powerless in labor, and utterly inadequate to the task of expelling the fœtus where no apparent resistance exists. As a remarkable instance of the former capacity, I remember to have witnessed, many years ago, the easy and rapid delivery of a primipara of a large and healthy boy less than twenty-four hours before she sank exhausted with consumption. All the circumstances were of the most favorable nature. The uterus contracted with great energy both during labor and afterward, so that there was scarcely any blood lost. I have also seen patients with fever, in an advanced stage of exhaustion, bear children with ease and rapidity.

The conditions of the soft parts which protract labor are sometimes quite appreciable. The whole of the genital canal, to be favorable to speedy and safe delivery, should be thoroughly lubricated with mucus, and an augury of much promise is an abundance of secretion, for this condition is almost always attended with two other important states, that of coolness and laxity or dilatability. Where there is scarcity of secretion there is almost always tenderness of the parts, as well as dryness, and both of these conditions indicate tardy dilatation. Hardness or softness of the os uteri may, however, be present independent of these conditions. Of course, hardness means undilatable, while softness means dilatable condition. We may ascertain whether the os is dilatable by introducing the finger into the cervix and making gentle attempts to open the mouth; if it yields between pains, and does not close in spite of the presence of our finger during pain, we may regard it as soft and dilatable, and expect that it will not resist the passage of the child, and consequently that it prognosticates speedy delivery, so far as this circumstance alone is concerned. But if, when we draw upon the circle formed by the partially or wholly closed os uteri, and it resists our efforts of dilatation between pains, it is hard and undilatable, and will be a cause of detention. Where this rigidity exists we may judge something of the length of time it will require for it to yield by observing the thickness of the edge of the ring or circle. If the edge of the circle of the opening is thin, it will yield to the pressure of the bag of waters or head of the child more readily than if thick and rigid. Indeed, I think in most instances where we find the edges of the os uteri thick and unyielding, it is because the cervix is not completely developed and ready for dilatation. What has been said with reference to moisture and tenderness of the os and cervix will apply to the vagina and perinæum. These must be moist, lax, and not tender to the touch, in order to afford easy passage to the head. In addition to this, the shape of the vagina is a matter that influences the prognosis. The vagina, in young women especially, is cylindrical, and embraces the cervix somewhat closely. This shape of the vagina should be lost before the commencement of labor, and it should be less closely applied to the cervix uteri. The condition of the perinæum should be changed as much as the vagina. Instead of being firm and unyielding, or tendinous, it ought to be thoroughly moist, dilatable, and tolerant to the free examinations of the accoucheur.

The bag of membranes play an important part in the first stage of labor. By their equable pressure, their soft unirritating consistence, yet decided firmness, they wedge or force open the os uteri and prepare it for the passage of the child's head. They should be firm enough to withstand the pressure from above, and the circular pressure around them, until dilatation is complete, and then not too strong to be ruptured by the force exerted by the uterus after this is accomplished. Sometimes the membranes are so frail that the first tonic contraction of the uterine fibres, as the organ settles down into the pelvis preparatory to labor, causes them to give way and permits the evacuation of a large part of the liquor amnii. It gushes away in a considerable quantity at first, and continues to drain away slowly with each recurring contraction until labor has fairly begun, when it is entirely lost. This is what is known among nurses as a dry labor, and they justly regard it as causing more suffering and being the cause of more protracted labor. The hard head of the fœtus settles down on the neck of the uterus, and as it is urged forward in the act of dilatation the unevenness of its surface causes more pain, and the parts yield less readily after the waters are evacuated, and thus dilatation is delayed sometimes for many hours. Again, as the liquor drains away, the uterine tissues come in direct contact with the child's surface, the inequalities of which become a source of irritation and increased suffering. The ovum, thus changed in shape by the draining of the liquor amnii, is quite different from the soft equal surface presented by it when there is enough liquor amnii to fill up the inequalities and interspaces between the child's limbs, presenting an elastic, equable, and unirritating surface. The membranes are occasionally so tough as to be an obstacle to the ready termination of labor; they do not rupture at the proper time, *i.e.*, when dilatation is complete, and consequently retard the delivery.

The presenting part and its position are subjects that affect the progress of labor. The vertex presentation, first position, is most favorable; other positions less so for speedy delivery; but the vertex in any position is a more auspicious presentation than any other part. The face is slower in being delivered than the vertex, is probably rather more difficult than the breech or feet—though this I think is doubtful—but more likely to terminate fortunately, so far as the child is concerned. The breech is not so favorable for the mother as the vertex, and is an extremely dangerous position for the fœtus, especially in primipara cases. The knees and feet are rather more dangerous to the child than breech, and somewhat more tedious and unsafe for the mother. The dangers to the fœtus in feet, knees, and breech presentation arise from the fact that as the head passes through the pelvis the cord is pressed strongly enough between it and the pelvic bones to arrest partially, or wholly, the circulation of the blood between the placenta and the fœtus. This arrest continues during the whole of the transit of the head, and in primipara that is long enough quite frequently to destroy the child. The kind of pain will influence the celerity with which the child will be expelled. Should the pains be increasing in severity and frequency, we may expect a speedy termination; but if they are irregular in this respect, or become less frequent, the labor will be slow. The first stage of labor is, upon an average, in primipara, twice as long as the second, and the second twice as long as the third. We may calculate that if the first stage has required six hours to terminate it, three hours will be occupied with the second. The disproportion between the first and second stages is greater in multipara,—after the first stage is terminated, the second being proportionately much shorter than in the primipara. All these calculations are subject to very great variation, dependent often, too, upon circumstances which we cannot appreciate. By an attentive consideration of the progress of dilatation we may sometimes make a shrewd guess at the time when it will be completed. Dilatation to the first half of the required size will take a much longer time than to finish the process. I think a like remark is applicable to the dilatation of the external parts. All signs prognostic of the progress of labor, and the time of termination of the second stage, are very uncertain, and we should not commit ourselves with any definiteness in this respect. We shall often be called upon for our judgment as to the time when the woman will be relieved from her agony, but it will be the part of wisdom and honesty to say frankly we cannot tell. We may encourage her with the assurance that labor cannot be protracted to any great length, and that from present appearance the termination will be a happy one. After the child has been expelled, we may ascertain the probable readiness with which the third stage will be concluded. If the uterus is flabby and large, with but little tendency to contract, we will not only in all probability have a tardy delivery of the placenta, but the patient is in great danger of hemorrhage. If, on the contrary, it feels firm and hard, and contracts with vigor and frequency, we may expect the placenta to be expelled very soon, and reasonably hope that there will be no hemorrhage. I have often noticed in very bad cases of hemorrhage that the pains were very frequent and extremely severe, the patient complaining bitterly of the suffering attendant upon their recurrence. As rightly indicated by Prof. Meigs, these pains are unsuccessful efforts to dislodge an obstruction in the mouth of the uterus. Generally, however, energetic after-pains denote vigorous uterine contraction and safety from hemorrhage. There are two general symptoms by which we can prognosticate with some certainty immunity from post-partem hemorrhage. In cases where the pulse is slow and tranquil we need not fear bleeding; but if the pulse is quick and jerky we should be careful for the welfare of the patient for one or two hours. But we should be in no hurry to be guided by a prognosis in reference to hemorrhage after delivery, as in some instances, where all appearances are most flattering, sudden and alarming hemorrhages supervene; or at the very time we are congratulating ourselves with the good auspices under which we are calculating the chances of safety, bleeding is going steadily on, to be manifested soon by fainting, vomiting, and coldness. At this particular juncture we should be *sure* of our premises before we come to a conclusion that might by any possibility place our patient in jeopardy.

MANAGEMENT OF NATURAL LABOR.

The main object in the management of natural labor is to keep the patient as comfortable in mind and body as practicable for such a condition of agony and distress. She is not to be treated as a sick person, but as one in great distress on account of most painful circumstances which cannot be averted but must be borne. And it is a very encouraging fact that we may alleviate this the most terrible suffering to which human nerve and muscle are ever subject. We can aid our friends very materially in bearing their pain. The parturient woman should be surrounded by every favorable condition at our command. Her room should be large and well ventilated, and kept at a comfortable temperature for her. She may be allowed and encouraged to eat her ordinary diet, in her usual quantities, to support her strength. Until the first stage has terminated she may as well continue to wear her ordinary clothing, or be allowed entirely to suit her own feelings in this respect, and remain on her feet, sit in the chair, or walk about the room, and follow her inclinations generally. When the second stage has fairly begun, appropriate preparations of the bed and patient should be made. The bed should be prepared by having a doubled bedquilt or blanket, or both, placed across the bed beneath the sheet. On this doubled quilt should be placed an india-rubber blanket or cloth. This preparation should be made across the bed at a place upon which the patient's hips will rest centrally. On the sheet should be placed, under the body of the woman, another sheet, folded so that it may be removed soon after delivery and replaced by another that is dry and not soiled. The woman should array herself in the ordinary night-dress, in order that she may not be under the necessity of changing her clothes too soon. It is common also to turn her clothing up and place beneath it an old skirt, that may also be taken away as soon as the woman has rested a while. As labor progresses and the patient becomes thirsty, she may be allowed cooling and acidulated drinks freely as she likes to take them. Women in labor are generally more or less excited, and some of them impatient and petulant, entirely unlike what they are under ordinary circumstances. Any bad temper she may show, no matter how preposterous or unreasonable, should be met by the utmost kindness and indulgence. A medical attendant or nurse that will not exercise patience and kindness under the most trying conduct of a parturient woman is quite out of place at her bedside. The number of persons in attendance will generally be determined by the choice of the woman, but it is better to have no more about than are useful. The nurse and one, or at most two lady friends, are all that are necessary under ordinary circumstances. We should by inquiry acquaint ourselves with the duration and character of the symptoms, whether the time is at hand when labor is expected, and other circumstances that will enable us to decide as to the probability of labor having begun, during which time we may watch the position and gestures of the patient, with a view to judge of the character of the pains. After this preliminary study of the case, which will give us a good idea of the necessity of immediate attention, or as to whether we may postpone further investigation, ordinarily it will be better to make vaginal examination. This will determine the course to be pursued. If the first stage of labor has just begun there is nothing to do but wait, unless we inquire into the condition of the bowels, and if constipation exists give an enema or some other laxative. Whether the medical attendant remain in the house of the patient will be determined by the circumstances of his proximity. If he can be easily summoned it will ordinarily do as well to leave the responsibility on the nurse to have him summoned at the proper time. He should by no means, unless under positive request, remain in the room with the woman during the first stage of labor. If the first stage is protracted to many hours it is best to make examinations to learn the progress very seldom, and then with great care, so as to avoid rupturing the membranes or irritating the vagina. The bag of waters should be preserved as a general rule until the os uteri is fully dilated. During the first stage the rigors, ordinarily very moderate, sometimes become alarmingly severe, and call for the use of an anæsthetic if none has been used before.

In the early part of the second stage of labor the management is about the same as the first; but when the presenting part begins to press with any force upon the perinæum the patient will require more attention. It will become necessary for her to assume the obstetric position. I have accustomed myself to both the English position on the left side, and that upon the back recommended by the accoucheurs on the continent, and generally permit the patient to choose between them. Whichever she may assume, her limbs should be well flexed upon the body. She will frequently desire to have something placed upon which she can support her feet, and if she is on her back it will be grateful to her to have some one steady and gently press upon her knees, and if upon her side she will often desire to have her back supported by the flat hand of some attendant. Many patients also are relieved by having some one to grasp her hands, so that she may pull and steady herself under her great exertion. With the feet, back, and knees thus firmly against the draught of the hands, she is in a condition to bring all her muscular system into action in her expulsive efforts. Whether any or all these aids be afforded will depend wholly upon her wish for them. Some patients are annoyed at the touch of another person for any purpose, and they ought to be left to their own inclinations entirely, and, so far as I can judge, they seem as well off and are delivered as speedily as those who exert the arms and legs more.

At the commencement of the second stage the medical attendant should examine well the presenting part, make a complete diagnosis of its position, and ascertain how near it has approached the perinæum. So soon as the presenting part has begun to press upon the perinæum he is expected to remain at the bedside of the patient and attentively watch its progress. When the external parts are distended the perinæum should be supported with the palm of the hand in such a way as to keep the presenting part well up against the symphysis pubis, and thus prevent it from carrying the perinæum downward far enough to rupture it. The object is not to retard the passage of the presenting part, but to mould, or rather assist, the perinæum in guiding it along the curve of the perineal axis, as described in speaking of the axes of the pelvis. It is believed that this support to the perinæum does much to prevent the ruptures which so frequently occur in it during the passage of the child's head; but I am not certain of the benefit exerted in this respect, and doubt whether there is much advantage in it. Too strong pressure, I think, will promote the occurrence of the very disaster we wish to avoid. It has doubtless fallen to the lot of all experienced obstetricians to meet with numerous cases in primipara and multipara who were delivered rapidly without any attention, and yet escaped with no more damage than patients sustained under his own personal supervision. And although I have operated for the restoration of quite a number of torn perinæi they have *all* occurred in the hands of competent medical men. The attendants in such cases have invariably been blamed for not properly supporting the perinæum, and although the profession understand this matter now, yet we all feel ashamed to admit that we *allowed* the perinæum to be rent during labor, and the people are strongly disposed to hold us responsible for the accident. After the head has passed the external parts it should be supported upon one hand in such a manner as freely to admit the air to its mouth and nostrils, and in order further to secure this object the face should be wiped clean of mucus, and, by introducing the little finger, that which is sometimes found in the mouth should be removed. There is usually quite a pool of liquor amnii, mucus, urine, fæces, and blood just where the head is expelled, and of course it should be held free of them. When these things have been attended to the finger should be slipped up the side of the neck to feel for the cord. It is often wrapped around the neck. If found coiled around the child's neck it should be disengaged, by gentle traction upon the circle, until sufficiently loosed to permit it to be passed up over the head. The cord is thus sometimes coiled about the neck twice, and occasionally three times, and it is impossible to disengage it in this way; sometimes we can in such cases increase the size of the circle so as to permit the child to pass through. In rare instances this is impossible, when, rather than risk it being torn from the abdomen at the umbilicus, it may be cut, the child speedily delivered, and the cord secured. If the cord is not coiled around the neck, or has been disengaged, we wait for the shoulders to be expelled, inclining the body up toward the symphysis. This, in fact, is all that is necessary to do until the whole body and limbs are expelled, by repeated pains. After the child is delivered, it should be placed so that its head may be perfectly exposed to the air, and allowed to remain attached to the cord until respiration is completely established. This fact will generally be announced by a number of lusty screams, but occasionally some interval intervenes, and breathing is established quietly, of which we can satisfy ourselves by a little attention to the movements of the chest and abdomen. After we are sure that the respiratory efforts are complete, we may separate the fœtus from the mother. A ligature, made by twisting about four strands of cotton thread together, at least one foot long, may be tightly tied around the cord about an inch from the umbilicus, and the cord divided half an inch beyond this. The cord should be safely tied, lest we have hemorrhage from it. I have seen cases of alarming hemorrhage occur several hours after the cord had been ligated, and am now very careful to assure myself that it is impossible for it to bleed. It is my own practice to use but one ligature on the cord, but many judicious and experienced practitioners tie it twice, one inch apart, and divide between them. Reasons of diverse character, that do not seem to me sufficient, are urged in support of this practice, hence I adhere to what I have always found safe and sufficient.

[*From September Number of Richmond and Louisville Journal.*]

"Dr. M. B. Kellar has written an interesting article in the Cincinnati *Lancet and Observer* recounting the results of fifteen cases in which he left the funis untied. This practice, it will be remembered, was advocated some time ago by Dr. King, of Washington, who claims for it many and important advantages over the method of ligation. In order to test the comparative merits of the two systems thoroughly, Dr. Kellar took thirty cases in the lying-in ward of the Cincinnati hospital, in fifteen of which he applied the customary ligatures to the umbilical cord, while in the remaining fifteen this procedure was omitted. The progress of every case was closely watched, and every symptom carefully noted. Of the infants whose cords were tied, 'four had severe diarrhœa, necessitating medical interference, but no jaundice. In eleven cases the liver was much enlarged, extending down to the ilium. Seven cases had profound jaundice with clay-colored stools. In four cases the skin presented a slight icteroid appearance, while in the remaining four the skin was clear (these, however, were the ones that had diarrhœa), and as for colic, this seemed to be a complaint shared in common by all, and seemingly these little ones were more troublesome, requiring more attention, appearing more fretful, in a word, they were not as good babies as those in which the umbilical cord was not tied.'

"Of the untied umbilical cords, the seventh was divided while the funis was still pulsating strongly, and the result was a loss of about three ounces of blood. The case, however, progressed favorably, and, in common with all the other cases, 'the cord dropped off about the fifth day; no evidence of jaundice; not often annoyed with colic; bowels were very regular; appetites were good, and sleep was sound.'

"The mode adopted for division of cord was by means of 'a dull pair of blunt-pointed pocket scissors, which hack through the cord, not at one cut, but by a sort of nibbling process.' No dressing of any kind was applied."

The child may now be handed over to the nurse, and our attention directed to the mother. We should place our hand on her abdomen, to ascertain whether the uterus is contracted enough to have expelled the placenta. If not, we may sit quietly by and wait until it has done so. It may require several pains or only one. If after waiting an hour the uterus does not act enough to pass the placenta down into the vagina, it will be very proper to knead it between the thumb and finger of the left hand, while we merely tighten the cord with the other. Where no unusual reason exists to retain it, the placenta is soon expelled by the contractions in this way. But sometimes the same pain that expelled the child, or a rapidly succeeding contraction, expels the placenta. In either case we find it within reach of the finger introduced into the vagina. There is no reason to wait for its expulsion from the vagina, but we ought to proceed to extract it from that cavity. To do this easily, in cases where the perinæum has retracted somewhat, we place the fingers of the right hand on the cord, at the point of its implantation into the placenta, while it is tightened by traction with the left hand. With pressure upon the cord thus tightened, the placenta is pressed downward into the hollow of the sacrum until relieved of its position in the mouth of the uterus. After this gentle traction forward and upward in the perineal axis and its extraction is easily effected. A want of care in the execution of both these manœuvres has resulted in the failure of many an attempt to perform the easy task of removing the placenta

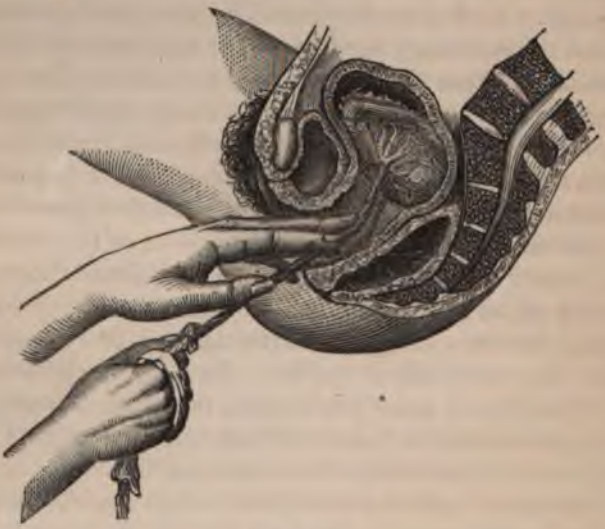


FIG. 106.

after it had been detached and "thrown down." As we extract the placenta from the vagina, it is better to give it a rotary motion, in order to twist the membranes into a cord-like form. They will thus be removed more completely, without the risk of tearing and leaving a portion of them in the uterus, to decompose and poison the patient. It is also an important precaution to examine them and the placenta attentively, in order to ascertain with some certainty whether some portion may not be left behind. Soon as the placenta is removed the abdomen should be again examined, to ascertain if the uterus is sufficiently contracted to prevent hemorrhage. A soft dry cloth may now be placed upon the genitals, passing it between the thighs. The best cloth for this is an old napkin, doubled four or five thicknesses. The clothes may now be arranged beneath the woman, so as to make her comfortably dry until the binder is applied. The best binder for first application is a soft towel ten or twelve inches wide, and long enough to encircle the body. The lower edge of the binder should reach the top of the pubis, where it should be pinned tolerably tight. From this, upward to the ensiform cartilage, it must be pinned smoothly and comfortably tight. It is often advisable to place over the centre of the abdomen a compress of cotton wool or some folded napkins, and fasten the binder over this. The main object of the binder is to supply the tension of the abdominal walls, and need not be used more than eight or ten days from first application. The patient may now be allowed to assume any position most comfortable to her, but should remain quiet for six or eight hours, or until danger of hemorrhage has passed by. The accoucheur should remain within easy call of his patient for at least an hour after the delivery of the placenta, to be present in case hemorrhage occur.

THE MANAGEMENT OF FACE PRESENTATIONS

Differs in no respect from that of the vertex, and consequently will not require any special consideration. They should be left entirely to the efforts of nature until the failure of her powers demands interference upon general principles, such as I shall try to establish for our guidance as I proceed.

BREECH, FEET, AND KNEE PRESENTATIONS

All demand the same kind of management. The first stage should be treated as in head presentations, and the management of the second is the same until the breech is expelled. From this time forward they require careful attention. We must remember that the danger is protracted pressure on the cord, and that our business is to avoid it. After the hips are expelled, and the umbilicus appears, the cord should be drawn down very gently until a fold containing six or eight inches is left disengaged and hanging loose outside the vulva. After this is accomplished we should satisfy ourselves that the face of the child is directed diagonally backward, and then we may again wait until the shoulders are expelled. If the arms do not very readily disengage themselves and fall out they may be aided in so doing. The index and middle fingers may be passed up the arm next the pubis to the bend of the elbow, and made to pass the arm downward and forward over the face until it falls out. We should not try to bring the arm directly downward, but it should be made to sweep over the face in its passage downward to the vulva.

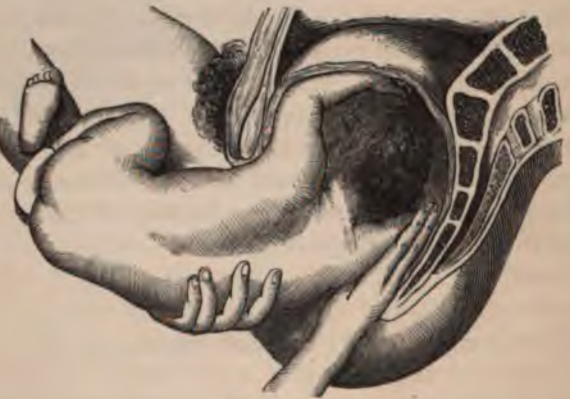


FIG. 107.

While the body of the child is held up toward the symphysis with one hand, the other may be made to execute the same manœuvre with the arm next the perinæum. After both arms have been extricated the face should be turned to one side of the pelvis, the cord again be extracted to a slight degree, and examined to see if it still pulsates freely. If it pulsates we may wait leisurely; if it does not we must without delay, but with great gentleness, accelerate the passage of the head. To effect this the fingers should be introduced as far as necessary to reach the face of the child, and one finger on each side of the nose planted firmly against the cheek bones, and kept in that position until the head is expelled. With these introduced fingers we must endeavor to turn the face backward and downward, while with the other hand the child may be held with part of the fingers on each shoulder and the body on the arm. The body of the child may be elevated toward the pubis, and gentle traction made with the hand outside, while the face is made to traverse the hollow of the sacrum and perineal surface by the hand inside. The hand with the fingers resting each side of the nose is of great service in one other respect, as it makes an open air-duct to the mouth and nostrils of the child, through which it may breathe during the time of extraction. Two difficulties arise during the expulsion of the head in breech and feet presentation that often cause dangerous delay: one is the extension of the arms upward, so that they enter the pelvis beside the head, and thus retard its passage through the superior strait, and also, by filling up the inequalities of the pelvic circle, increase the risk of pressure on the cord. They ought to pass below the head, on the chest in fact, and this malposition is often the effect of traction on the body of the child before the delivery of the shoulders, while the uterus is not acting. If the uterus is allowed to do all the expulsion, it keeps close down over the head and arms, and there is no room for them to be elevated; but if the body of the child is drawn down while the uterus is relaxed, the arms will be elevated almost invariably. The other difficulty is too early departure of the chin from the chest, and the consequent engagement of the occipito-mental diameter instead of the occipito-frontal. And this difficulty arises from the same cause—*too much traction* on the body of the child. From this it will be apparent that no traction should be made until the shoulders are expelled, and then not if the cord pulsate freely. I knew an instance where the head was detained in the pelvis one hour and a quarter, and the cord pulsated all that time, until the flexion of the head upon the chest was restored and the head delivered. The child was not small, — I think it must have weighed eight pounds. I am quite sure that many children are sacrificed by too precipitate and inconsiderate interference. Too much traction is the great evil to be avoided in our interference in these cases. Even while the head is in the pelvis and the cord has ceased to beat, we may be in too great a hurry, and pull upon the child's neck hard enough to damage the structures irreparably. Traction of seven or eight pounds is not considered very much; but I think very few of us would be willing to hold a child up by the neck after it was born. When the hand presents with the head, or descends in advance of it, as shown in Fig. 108, we will not be under the necessity of interfering unless for special reasons, deducible from general consideration, as exhaustion, etc., when we must be governed by general rules.

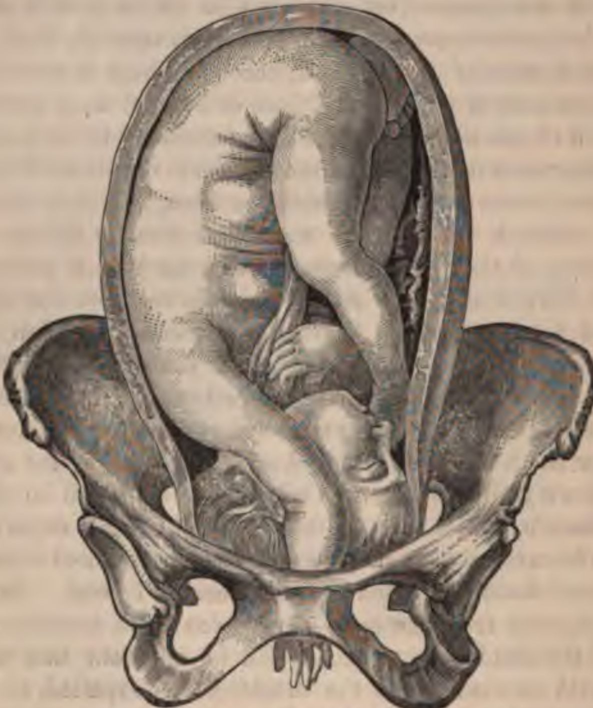


FIG. 108. Presentation of Head and Hand together.

Ear presentation of the head, and brow presentations, should be left entirely to nature until some reason besides such position exists for interference, and the same rules may be observed as in face presentation. There are very few cases, *if any*, of head presentation that are susceptible of change by the use of the hand in the pelvis.

ANÆSTHETICS IN LABOR.

I think the members of the profession are now almost unanimous in sanctioning the use of anæsthetics in natural cases of labor. They may, I think, be used with more safety than in most other forms of suffering, most likely because it is not ordinarily the purpose of the obstetrician to cause these profound effects. They *sometimes* act beneficially in every respect, but at *other times* their influence is attended with unpleasant effects in some particulars. Probably the most frequent ill effect from their use is their occasional tendency, when given in moderation, to lessen the efficiency of the pains, and when administered too freely I think they generally do this. Their influence in this respect is sometimes so marked that the labor is protracted very considerably. Another effect, less frequently observed, is to render the patient so delirious as to make her unmanageable unless kept too profoundly affected by them. Chloroform sometimes also very much increases the nausea and vomiting. These are, however, inconveniences that will not weigh much in the question as to the general propriety of their use, as they may be obviated by proper management. In view of the many accidents that have resulted from the use of chloroform, and not being sufficiently familiar with the effects and mode of administering the several new anæsthetics lately introduced, I have for some time contented myself with the administration of sul. ether, reserving chloroform for those cases that are affected by ether with great difficulty; for I occasionally find patients that ether will not influence with sufficient rapidity to be of any service to them. As a general thing I do not sanction the administration of the ether until after the first stage is over, and withhold it as soon as the second stage is finished. But when the first stage causes a great deal more suffering than usual, it will sometimes be advisable to give it then. In tedious, difficult, and operative cases of labor, I feel as much under obligation to use the anæsthetic, and make as profound impression with it, as in the performance of any of the more painful surgical operations, and for all the same reasons. The method of administering I usually employ is to pour thirty or forty drops of ether, or, if I use chloroform, about half that quantity, upon a folded linen or cambric handkerchief and give it to the patient, letting her apply it to the nostrils. If this is done each time when the pain begins to be felt, the effect will be very much to relieve the acuteness of suffering caused by the pain, without materially lessening its efficiency. As the head distends the soft parts, and adds very much to the suffering, we may be a little more liberal in the use of the ether; and in primipara as the head passes the vulva, if the anæsthetic has had no disagreeable effect, there can be no reasonable objection to causing complete insensibility until after this is accomplished. We not only thus save our patient from passing through the unspeakable agony connected with this crowning terror, but the tissues distend and relax better under the full influence of the anæsthetic. They are relieved of all irritability and reflex tendency to contraction and rigidity, and consequently there is less danger of extensive rupture.

Damage to the Perinæum.—This is sometimes extensive, although generally quite trifling. A partial destruction of the anterior portion of it is very common. Writers divide these ruptures into three varieties:—The first, and by far the most common, is the incomplete variety, extending through any portion of it short of the sphincter ani; the second and next most common variety is the complete, or an entire division of all its substance from the fourchette into the rectum, including, of course, the sphincter; and the third is when the child has been expelled through the perinæum—having passed through the posterior wall of the vagina—without tearing the sphincter of the anus or vagina. The first and third varieties are unimportant, so far as their results are concerned, as both of them are susceptible of relief, and, in fact, are generally cured without any interference. But the second variety is a deplorable accident. As has been intimated, the accident of extensive rupture of the perinæum is more the result of the condition of the parts than want of attention from the attendant;—smallness of the vulvar opening, unusual rigidity of the muscular fibres, and other inappreciable causes. It is not easy to account for the occurrence of the accident in some instances. The only case of central rupture I have had an opportunity of examining occurred in the practice of an educated and experienced physician, whose hand was on the perinæum at the time rupture took place. The patient was about forty years of age, the mother of six other children, the last four years of age. The labor was rapid, the second stage lasting not over three-quarters of an hour. When the head—the position of which the medical gentleman did not accurately determine, but believes the forehead was anterior—came down upon the perinæum, instead of receding, the edge approached the symphysis, until, as the effect of one very severe uterine effort, the centre of the perinæum parted, and the head at once emerged. The sphincter was complete, and the anterior portion of the perinæum, from the edge of the fourchette to the margin of the rupture, was about half an inch in width, very thick and firm.

The rupture of second variety probably more often occurs in connection with the use of the forceps than in cases of spontaneous labors, because the head is forced through the parts with greater rapidity, and they do not have time enough to dilate and let the head pass. We may ascertain the extent of the rupture very readily by introducing one finger into the rectum and the other into the vagina. If the sphincter is torn through, the fingers will meet without any intervening tissue, and the amount of existing substance will separate our fingers when the rupture is incomplete. It is a question with the inexperienced how far they are called upon to interfere with them; and it is a great comfort to know that in the incomplete and central varieties the management is very simple and effective. A rupture short of the destruction of the sphincter will almost always heal up and restore the perinæum by merely keeping the patient on the side, with her limbs approximated, for eight or ten days. She should remain on her side, quiet, for a number of days, because in this position a good apposition will be a spontaneous result, and the lochia will pass out of the vaginal opening instead of through the wound. The union is generally by the first intention, through the greater part of the wound; but sometimes it fills up by granulations instead. The wound should be examined after the eighth day, with a view to see how much adhesion has taken place, and if the result is not entirely satisfactory the wound ought to be stimulated every third day for a time, to prevent cicatrization from taking place on the ruptured surface, and keep up active granulations until the chasm is filled up.

We should remember in this connection, however, that some of these cases do not heal up, and the deficiency in the floor of the pelvis remains, the cause of great inconvenience on account of the prolapse of the pelvic organs. From a knowledge of this fact some practitioners use what the French call *serre-fines*, to retain the edges in contact, or, in the absence of these, introduce some stitches. Both of these methods are attended with good results in almost all cases. They are both attended with some pain, and after all do not keep the parts in better contact than the plan I have recommended, nor succeed in getting a more perfect cure. The second variety, or complete division of the perinæum and sphincter, will sometimes terminate in the way the first variety usually does, in a spontaneous cure.

I was fortunate enough to witness this in a case of more than ordinary interest. The patient was a large and very muscular woman, the mother of two children, both of which weighed respectively over twelve pounds. She had suffered the accident with the first child. After the second was weaned, I operated and closed the rupture according to Mr. Baker Brown's method. The cure was complete. Two years afterward the patient was taken in labor with the third child, at five o'clock P. M., and before eight was delivered of a very large female child, weighing thirteen pounds, with the face to the pubis. To my amazement the perinæum split under my hand from before backward, tearing through the sphincter along the line of the cicatrix. I examined by the light and with my fingers, and found the perinæum entirely destroyed. I insisted upon inserting sutures at once, but the recollection of the suffering connected with the operation deterred the patient from consenting to it, and I was compelled to be satisfied with placing her on the side, putting a roller around her limbs, and giving her opium enough to prevent the bowels from moving for ten days. On the ninth day I found complete union and the patient recovered perfectly. She has since been again delivered by my colleague, Prof. E. O. F. Roler, of a smaller child, which came through occipito-anterio without the perinæum sustaining any injury. When this accident takes place and is recognized, it is a question of no small importance what shall be done.

Some writers, in view of the fact that spontaneous cures do sometimes take place, defer any operative procedure for an indefinite length of time, until the patient has entirely recovered from her confinement and is in the enjoyment of good health, taking the precaution I have mentioned in connection with the above case, and if the patient does not recover thus, to perform perinæorrhaphia; while others insist upon the insertion of the proper sutures very soon after the occurrence of the accident. And I think that this is the wiser plan. The suffering of the patient is somewhat increased, to be sure, but not to the extent that it would be by a new operation, and the chances for a cure are quite as good as at any future time, while the inconvenience and discomfort of a cleft perinæum for several months are avoided by this plan. Within the first twelve hours after delivery is, I think, the best time to operate for the closure. I would refer the reader to my work on the Diseases and Accidents of Women for an account of the proper methods of operating.

NATURAL LABOR IN MULTIPLE CASES.

In most cases of multiple labor it is natural and easy, but I have thought more slow than simple cases. The protraction is generally due to the tediousness of dilatation, but the expulsive efforts of the uterus are also less efficient on account of great distention, and also, perhaps, because the contents of the uterus are less solid, and the pressure of the uterine contractions less direct. One fœtus is generally expelled head first, and the other by the breech presentation, but occasionally they are both delivered alike by the cephalic or pelvic end of the trunk. They succeed each other quite readily. After one is expelled the uterus apparently rests for a short time,—during which the elastic contractility of the parts lessens the size of the cavity—and then rouses up to strong contraction and expels the second fœtus more easily and quickly than the first, mainly because the parts are well dilated and afford no resistance to the passage. We have instances on record, however, where the second was not expelled for several days after the first, and it is not very unfrequent that some hours elapse before the second is expelled. We are assured that there is a twin in the uterus, after one child has been expelled, by the abdomen remaining large, almost apparently as if no fœtus had been expelled, by the placenta not coming down after sufficient pain, by the presentation of the bag of waters at the mouth, and finally by feeling the presenting parts of the second fœtus.

The management of twin cases differs so little from ordinary single cases that there need not be much said more than to refer to natural labor. Without some condition arises to require interference, nature should be left to accomplish all the steps of it. Difficulties arise in twin, as in other cases of labor, from malposition, deformities, and, in fact, most of the circumstances that occur as complications, and they call for interference only as they thus resemble difficulties in the simple form of labor.

ATTENTIONS TO THE CHILD.

Soon as our immediate attention to the mother is no longer required, we should look after the child. And the first, after noticing whether respiration is complete, is to see if the cord is securely ligated. This may be determined by squeezing it from its insertion toward its free extremity between the thumb and finger, and if the blood can be made to start from the cut end of it there should be another thread thrown around it for better security. If it is apparently healthy and vigorous, the nurse may proceed at once to dress it; but if very feeble, or the respiration imperfect, it must be kept quiet, wrapped in soft flannel in a warm room, where its face may be exposed until its condition may be improved by proper measures. There is no particular necessity for being in haste about washing and dressing the child, if there is any reason for not doing so. Nurses and mothers, many of them, believe that unless the glutinous covering is removed from the skin very soon, some damage will result; but this is not so, as it is bland and unirritating, does not decompose readily, and will disappear in a few days spontaneously. Yet for the sake of cleanliness the child may be washed at the earliest convenience of the attendants. The process of washing will seldom give us any trouble, as nurses generally understand how it should be done, but it is a part of our duty to know all about it also. The first thing to be done is to remove that covering to the skin called technically vernix caseosa, and this can be done very imperfectly until it is thoroughly mixed with oil. Some animal oil is best, as lard, goose-oil, or neat's-foot oil. The oil can be applied copiously with a fine sponge, and the vernix may be removed with the sponge and oil without the aid of soap and water. A most excellent nurse of my acquaintance always removes this matter with the sponge and oil, and dresses the child in flannel, without using water at the first cleaning; but generally, and perhaps it is better, the unction is followed by a thorough washing with fine toilet soap and water, applied with a soft sponge until every part is thoroughly cleansed. There is more difficulty in cleansing the flexures of the neck and thighs and axillary regions than other parts. Some children are born without even a trace of the vernix caseosa, so that they do not need more than a little soap and water to prepare them for dressing. The mouth should be wiped out with a fine cambric handkerchief, but there should not be anything on it. This wiping is intended to remove any tenacious mucus that might embarrass the breathing by being drawn into the glottis during inspiration. It is the custom of some ignorant nurses to pour whiskey or some equally pernicious compound on the handkerchief when they use it for wiping out the mouth. The simpler the first dressing of a new-born infant the better. The profession ought to object to the numerous superfluous appliances so frequently made use of that restrain the motion of the limbs, and, in fact, any of its muscles. The stump of cord should be covered longitudinally with soft linen, and then, rolled in soft tape, commencing at the umbilical attachment and proceeding outward to the free extremity, where it may be secured with thread. This accomplishes the object of preventing the desiccating cord from remaining in contact with the delicate skin, and when this is effected all is done that is necessary. Nurses and mothers should be taught that there is no danger of the child falling to pieces or sustaining rupture if not encased in a swathe from head to foot. And the belly-band should be unceremoniously discarded as merely impeding respiration and circulation. The only dressing further necessary is a loose night-gown of soft warm flannel, coming up well to the chin, and tied with a tape, with sleeves long enough to cover the whole arms, with a diaper, and a shirt over the chest. Wrapped in a sufficient amount of covering to secure warmth, according to the season, or immediately placed in the warm bed of its mother, the child is rationally and sensibly dressed. I am glad to see that there is a tendency to this simple mode of dressing an infant the first time, by some of the profession at least. Dr. Fletcher, now Professor in the Indiana Medical College, wrote a very sensible article, in advocacy of this and other reforms of the kind, in the *Cincinnati Lancet and Observer*, about two years since. If the social status of the mother will not permit this plan to be pursued, we should have no more dressing than cannot be avoided, in the face of the perverse taste of our times. After the child is dressed, before being presented to its mother, nurses are in the habit, unless closely watched, of feeding it with some vile compound, from a fancied necessity for purging it, or lest it might starve. We should be strict in directing that nothing be given but the breast. This direction will be sufficiently explicit for most nurses; but it is well to deter them from giving anything else, by stating the injury done in disobeying the injunction. If the mother is well, the child may be placed to the breast in an hour or two after it is dressed, or as soon as she is rested for the task. Good results from this direction to both parties: the sympathetic effect upon the uterus causes more perfect contraction in it, and the stimulus to the gland encourages early and gradual secretion of milk. In this last respect it is quite valuable to the mother, in preventing the sudden congestion of the breasts that gives rise to milk-fever, and is not unfrequently followed by inflammation of the glands. And it furnishes the child with the *kind* of nourishment it requires, and in sufficient quantities to supply all its demands. The effect of the secretion contained in the breast at the time of delivery is to purge the meconium from the bowels of the infant and stimulate the urinary secretion. Very often the infant discharges a large part of this very dark green excrement immediately after it is expelled from the uterus, and continues to have free evacuations until the stools change to a light yellow color. This last is the natural color of the fæces of young infants after the meconium is thoroughly evacuated. In some cases it does not so readily and completely pass off, but remains in the intestines, when stools continue dark green, mixed with mucus, small in size, and of frequent occurrence. The little patient shows signs of distress, and occasionally vomits. If the symptoms continue for two or three days, serious disease, and perhaps convulsions ensue. When this irritation of the bowels occurs three or four days after delivery, and the stools have not changed their color, the patient should have some castor-oil—a large teaspoonful — to purge it off. When it acts freely the change will take place, and the symptoms generally be relieved. While this treatment may be necessary in rare cases, we should not countenance the administration of even this simple cathartic in anticipation of the evil. The next item in the transition from fœtal to infantile life that will demand attention is the management of the cord. Soon after it is tied the cord begins to exude an albuminous serum that glues and stiffens the cloth with which it is surrounded, and in a few days it shrivels up into a horny fragment that is very hard. From the third to the ninth day it is separated from the abdomen and falls off. This separation occurs more frequently on the fifth day than any other. A sort of ulceration is the process by which the separation is effected, and the ulceration sometimes continues to affect the skin after the cord has fallen off, and requires treatment to heal it up. It generally yields readily to some simple ointment; but if it should not, some mild astringent or stimulant once a day will ordinarily be all the necessary addition. Tannic acid, pulverized nut-galls, calomel powder, will generally suffice. But a weak solution of nitrate of silver may be called for if the case is obstinate. But generally the part is healed over, and the umbilicus presents the appearance of a round, depressed, and puckered cicatrix, or an elevated pouting one. This elevation is sometimes so considerable as to constitute a hernia, in which may be insinuated a knuckle of intestines or some omentum. During the act of desiccation and decadence the cord and its wrappers should be moistened with sweet-oil or simple cerate, to prevent it from chafing the skin. The casting off this fœtal appendage, and deriving its nourishment from the mother's breast, completes the transition from fœtal to infantile life, so far as external appearance is concerned. In reality this change is not perfect until the foramen ovale, ductus arteriosis, and ductus venosis are closed, which may not be until the end of the first month.

But the child may be born dead, or in a state of apnœa. If born dead, it may have been dead for months or weeks, for a few days, or only just before, or it may have died during labor. If the child has been dead for more than forty-eight hours, it begins to show evidence of decomposition; if for weeks or months, decomposition will have been far advanced. I saw one a few days since that had been dead in the uterus for fourteen days, and was perhaps the victim of uræmic poison, in which the skull had collapsed, and the bones were easily moved about in the fluid contents of the scalp, so that the head flattened out like a bag partially filled with fluid, the eyeballs had bursted and the lids were sunken, while the epidermis was easily separated from the skin. A maceration of six or eight weeks in the liquor amnii reduces the muscles to a semi-liquid substance which is confined by the skin, and in which the bones are contained as in elongated bags of fluid. There is none of the odors of sulphuretted or carburetted hydrogen, but in their stead a faint sickly smell not much less disagreeable. There is a peculiar limpness and laxness in the joints and limbs of a recently dead fœtus that is enough in itself to distinguish it from one in a state of apnœa. As a general rule, it is sufficient to decide the death of a fœtus to be unable to discover any signs of circulation. If the heart does not beat there is but little doubt that the fœtus is dead, and yet there is that little doubt, and we should give it the benefit of the doubt, provided there are not other positive signs of death, such as decomposition, as just noticed, laxness of the muscles, etc. A fœtus that is not dead has some muscular elasticity, which will exhibit itself in the want of perfect unimpeded flatness of fall of the limbs. They are somewhat flexed, and have a tendency to remain so, while the legs and arms of a dead fœtus lie perfectly flat and straight, and show no elasticity of fibre.

APNŒA.

The conditions of the still-born fœtus are widely different, and call for management so unlike each other as to require for each a special consideration. The first condition I shall mention depends upon a congested state of the brain. It is properly considered congestive, as there is not generally extravasation of blood in the cerebral tissues, but the blood-vessels are very turgid and strongly injected with blood. This condition is easily detected when present in a marked degree; the face is bloated and discolored with blood, the eyes are prominent, the skull is misshapen and elongated, while the scalp is almost black with blood unoxygenated. The cause of this condition is compression of the head, which has generally been long continued. Large heads forced through small pelves, or strongly compressed with instruments, are likely to suffer in this way. In a severe form this is a very fatal condition, but in the slighter degrees it is generally overcome. Such cases should be treated by depletion from the cord by cutting it, and allowing from half an ounce to an ounce of blood to escape; warm bath to the lower part of the body and legs, and cold to the head by pouring a stream of cool water upon it for a short time. Sometimes a stimulating injection, as a few drops of turpentine to an ounce of castor oil, will cause the bowels to move quickly and freely, and thus do much toward relieving the head. Artificial respiration should also be resorted to if these means do not very soon show signs of some good effects. An opposite condition is one caused by loss of blood, and may be denominated syncopal. In such cases there has been, during labor, from separation of the placenta more or less complete, or rupture of the cord, a loss of blood sufficiently great to cause a suspension of animation. The appearance of the fœtus in this condition is very different to what it is in the other. In this it is pale almost to bloodlessness, the eyes are not prominent, the mouth is open, and if the heart is felt to beat at all it is very weak. In this case the warm or tepid bath will do harm; the child should be wrapped in blankets heated as warm as they can well be made, placed very near a warm stove or other fire, with its head toward the source of heat, and lowered to an angle—with its body and limbs—of forty-five degrees; and without any more agitation than we can avoid, artificial respiration should be performed. The fœtus must be kept as still as possible, and a high degree of dry heat be applied,—no attempt made at dressing for twenty-four hours or more. As it becomes partially animated we may give two or three drops of aromatic spirits of ammonia, every two hours, in a teaspoonful of breast-milk. Great care will be necessary for several days not to tax the strength of the little patient by too much handling for any purpose. Apnœa by interruption of the circulation is another condition of still-born infants. It must be remembered that the circulation to the fœtus is the medium of respiration, and that the blood in the fœtus becomes unfit to sustain the vital functions if it is not constantly passing to and from the placenta. Before delivery pressure of the cord between the head and pelvic bones, or pressure of the cord between the uterus and some prominent hard part of the fœtus, are the most common methods of cutting off the circulation. After the child is born the same thing may take place, on account of the cord being coiled tightly about the neck, or it may be stretched over some part of the child, owing to the position in which it lies. The appearance of the fœtus is characteristic. It is a dark purple color all over; in its face, chest, body, hands, nails, everywhere, this blue color prevails. The head is not pressed out of shape, as in the congested form, yet the scalp and features are as dark. A condition somewhat similar may be produced by allowing the face to be immersed in the pool of liquids near where it is expelled, or the membrane to be unrupted, or otherwise applied over the mouth and nostrils. Friction in the warm bath, or, perhaps just as well, with dry warmth, artificial respiration, and stimulating turpentine injections are the means for resuscitation. Then there is a large number of cases that cannot be traced to any of these conditions, in which the child seems vigorous, but does not breathe. The surface is natural in temperature, color, and plumpness; no deformity of the head, or, in fact, any appearance indicating the cause of the apnœa. There seem to be no reflex sensibilities, or they are so dull as not to be aroused by contact with the cold air, and the circulation gradually ceases because not sustained by respiration. The remedies for this class of cases are such as will arouse the reflex sensibilities of the skin; a sudden and copious shower of very cold water thrown with force upon the elevated head and shoulders, repeated every half minute, is often quite sufficient. But a still more effectual method is to dip the body in a bath of about one hundred degrees Fahrenheit for forty to sixty seconds, and then throwing over the entire surface, with a forcible dash, a pint or more of very cold water, and the application of artificial respiration. There is still another condition that is sometimes apparent and requires its own treatment,—I mean what Dr. Hodge calls asthenia, in which there is great feebleness of the general powers, on account of imperfect development or feebleness of physical formation. These children are small, their limbs soft and emaciated, and if the heart beats, its pulsations are very quick and feeble; the surface, instead of being ruddy, is waxen in color, or sallow. Dry heat, energetically applied by blankets, placing them close to a fire or stove; artificial respiration; a few drops of arom. spts. of ammon., and perfect quietude, is all we ought to try to do toward resuscitating them. I have repeatedly spoken of artificial respiration, and therefore shall try to give the reader a general idea of it in its application to newly born infants. There are three methods of making artificial respiration. The old plan, which, when properly performed, I believe for infants is, in some respects, preferable to any other, is simple and easily done right. It requires less movement, which, in children enfeebled by loss of blood or native stamina, is a matter of very great importance. To perform it right, the fœtus should be placed upon its back on a firm pillow; under its shoulders should be placed a compress four inches thick, six inches wide, and ten or twelve long; this compress may be made of towels or napkins, and should be quite fine. The fœtus should be so placed that its head hangs over the compress backward, in such manner as to bring the larynx on a stretch and cause it to compress the œsophagus. In this position the passage to the larynx is more direct, and as the pharynx is closed by pressure of the larynx, the air will not go into the stomach. The nostrils are to be held by one hand, while the mouth of the operator is placed on the mouth of the fœtus, with a cambric handkerchief intervening, and the air forced into its lungs. There is not much danger of the air being forced so strongly into the lungs in this way through the handkerchief as to damage the lungs of the fœtus, and yet no more force should be used than is necessary to fill them. When thus filled the operator's mouth may be removed, and gentle pressure made with the flat hand over the chest, in order to completely expel the air. This should be repeated ten or twelve times a minute, until an effort at respiration is made by the fœtus; we may then wait for one or two minutes, and if the effort at respiration is not repeated we may renew our own efforts. We thus continue until respiration is established, or until we are satisfied that there is no use in further attempts. It is interesting to notice the effect upon the palpitation of a scarcely perceptible heart. One full inflation starts up the heart, adds frequency and force to its action, and often color to the face; a long interval and it languishes, but is awakened into activity immediately by another inflation. The method which I think is next best is also simple and easily accomplished. The patient is placed in the prone position, with the head and chest elevated or not, as the circumstances of the case would seem to demand. If in the syncopal or asthenic condition, the head and chest should be very much lower than the body and hips, and if the congestive variety, higher; with the other conditions it does not matter. The head should be held so that the mouth and nostrils are not closed by lying against or on anything. In this position the arms should be pressed firmly against the sides, to expel any air in the lungs; they should then be elevated, so as to press, one on each side, firmly against the head. The arms, being thus raised, elevate the ribs and expand the chest by means of the pectoral muscles, which are attached to the humerus. The arms should again be carried down to the sides, and pressed against them, to expel the air from the lungs. This movement may be repeated as often as directed for the other method. Marshall Hall's method is so well understood that I need scarcely describe it. The fœtus is placed upon its face, and one arm is doubled, so that the forehead rests upon the forearm. The chest is grasped in the hand, gently squeezed and pressed against the table upon which it lies, until the air is pressed out of the lungs; if respiration has taken place, the grasp and pressure is relaxed, and the fœtus turned slowly over upon the back. With the arm retained in the same position, the child is turned again upon its face, with the forehead upon the arm, its chest compressed, and then returned to the dorsal position. These movements are to be repeated several times a minute, until respiration is obtained. This is an excellent method of performing artificial respiration, with which I have succeeded on several occasions. When the child is very feeble the head should be placed downward, much below a level of the hips and feet, and the body exposed to as high a temperature before the fire or stove as can be commanded at the time.

In a recent number of the London *Lancet*, Dr. Bain describes a practice suggested by Pacini, in Florence, which seems to be very simple and effective in making artificial respiration. The patient is placed on his back on a table, while the operator takes his place at the head of the patient. The operator places his hands in the axilla, on the dorsal aspect, and pulls the shoulders forcibly upward toward the head as far as practicable; he then relaxes and presses the arms down upon the sides, so as to compress the chest. The mode of action in this method is similar to Dr. Sylvester's, described above, in which the arms are drawn up over the head. It sometimes requires great perseverance to succeed in resuscitating these still-born children by any of these methods, and we should not abandon all efforts until it is entirely apparent that life is extinct. I have known more than one instance of success where efforts at resuscitation had been employed for more than an hour.

PUERPERAL CONDITION.

Phenomena.—Soon as the last pains expel the placenta, and even before this is entirely accomplished, a great change is apparent in the condition of the patient. The great mental excitement and nervous agitation that absorbed the whole energies of the patient, almost to distraction, and controlled her movements, subside, and leave her in a state of exhaustion, or of quiet and grateful repose, according to the intensity and duration of labor. The pulse drops from eighty or upwards down to between sixty and seventy, is quiet, and not very full. The copious perspiration, which had been running from every pore on the surface, gradually ceases, the heat suddenly falls, and in many instances the patient is seized with chills and rigors, that often become quite energetic. The patient complains of cold; her feet are especially so. In the course of half an hour reaction takes place, the pulse rises to something near the natural standard, warmth is restored to the feet and surface generally, while the skin becomes moist and soft. This depression and subsequent reaction are not produced entirely by the previous excitement, but are due to some extent to the great change in the circulation or distribution of the blood. Before labor the abdomen is distended to a great degree by the gravid uterus; the blood of the abdominal cavity is pressed out by the enlarged uterus; the viscera, most of them at least, do not contain as large an amount of blood as usual with them. The surface, extremities, head, and spinal column are fuller of blood than is their ordinary quantity; the bloated or swollen state of the face, producing an appearance of grossness, a puffy and dusky condition of the skin generally, and an appreciable distention of the superficial veins, upon the termination of labor are changed; the distention of the abdomen is removed, and this cavity becomes, in a certain sense, a vacuum, into which the blood is attracted in large quantities. There is an abdominal congestion; all the organs, except perhaps the kidneys, receive a large amount of blood. This fluid deserts the extremities, skin, head, etc., hence the external coldness, smallness of pulse, etc. Warmth is usually at once applied, or the tension of the abdominal walls is restored by a tight bandage, or both, and appropriate reaction occurs. The circulation is further changed by the contraction of the muscles of the uterus expelling a large quantity of blood from its own vessels into the general vascular system. This great and sudden change in the circulation is attended, of necessity, with important perturbations, and it requires some hours for all its effects to pass off; and there can be no doubt of the equalizing influence of the binder, when judiciously employed, in tranquillizing the circulation. I need but remind the reader that at the time of labor the blood is not in the most healthy and conservative condition. More water, white globules, and fibrine, and less red globules; the blood is less plastic in its capacities, and enters into the rapidly destructive processes of asthenic inflammation, under morbific influences, with great celerity. Another item in the condition of the blood is the retention of excrementitious substances, on account of the slow and imperfect elimination of the latter weeks of pregnancy, thus rendering it more likely to be deleteriously affected by anything that might increase this state of things. This view of the changes immediately succeeding labor in the general conditions of the system, prepares us to appreciate the necessity of some special attention to the lying-in state. But there are many very interesting changes, contemporaneous and subsequent to these, in the genital organs themselves. The uterus, as before stated, contracts sufficient to expel a large part of the blood and keep it entirely out of its own vessels. It thus is transformed, in the course of a few hours, from a highly vitalized organ, drawing from the general sources of nervous energies and the nutritive capacities of the assimilative organs, to a neutral condition, and thence farther entering into a process of degradation and atrophy. Such sudden and considerable changes in an organ of so vast magnitude and great vitality cannot be unattended with important influences upon the puerperal state. According to the researches of Wieland and Scanzoni, the uterus, immediately after delivery, is smaller than it is a few hours later. At first it is the size of a child's head, and is half way up to the umbilicus; in three or four hours it is almost or quite up to the umbilicus, having relaxed and arisen this much. It remains about that size for twenty-four or thirty-six hours, when involution commences and proceeds steadily forward to completion. The mode of involution is now pretty well understood. The muscles contract the uterus down to a small size, and in doing so constrict the vessels at all points, so that in every portion of this great mass the blood becomes suddenly deficient; a deficiency of blood is necessarily attended with a deficiency of nutrition. As the muscular fibres have thus cut off their own supply, they necessarily starve, so to speak, and they begin to change in structure; the muscular fibre cannot be maintained in its perfect state; instead we have the rudimentary fibres and fatty globules. So long as the muscular fibres continue to exist in their enlarged form they continue to contract, and more thoroughly diminish the calibre of the vessels, until they are scarcely visible. Thus the muscular and vascular tissues are reduced to the condition of the unimpregnated uterus. On the third or fourth day the volume of the uterus is reduced to the size immediately after birth, half way to umbilicus. From this time the reduction is less rapid, but at the third week the fundus is felt at the top of the symphysis. In the fourth week it disappears behind this bone into the pelvic cavity. The involution is not complete until the fourth month.

The mucous membrane of the uterus, a few hours after delivery, is soft, friable, and easily separated from the muscular tissue, and, according to Colin, it is not until the fortieth day that it is entirely organized and perfect in structure, fitted for the discharge of its functions as a menstrual and decidual surface. The placental portion of it is at first covered with small clots of blood, hanging like little leeches from the patent mouths of the ruptured placental vessels. This part is somewhat elevated above the surrounding surface, and is tumid and puffy in appearance. The uterus is generally occupied with a number of small clots adhering to different parts of its surface, or lying free in its cavity. In a few days the clots are cleared away, and there is only a small quantity of the lochial fluid in the cavity; the membrane is still soft, and the epithelium has begun to form about the fourteenth day. At this time the orifices of the placental vessels are closed, and we see nothing but small dimpled depressions in their place. About the cervix the mucous membrane, a few hours after delivery, is generally tumid, and there may be found abrasions, or places where the epithelium is torn, and even removed to some extent, owing to the violent pressure it has sustained from the passage of the head. The mucous membrane of the vagina is tumid and injected in twelve or fifteen hours after delivery, showing a tendency to reparative inflammation. At the orifice of the vagina there is always more or less violence done to the integrity of the mucous membrane, and in many instances it is completely torn through and left in a condition to be repaired only by granulations. It will be seen by this description of the post-partum condition of the mucous membrane of the uterus and vagina, that it is raw and denuded of its epithelium in many places. From these places there exudes blood at first, serum and mucus subsequently, and finally more or less pus. At first, and immediately after delivery, blood continues to pour out of the divided placental vessels,—in primipara in smaller, in multipara in larger quantities,—on account of less firm contractions in these last; this is the beginning of the *lochial* discharge. As the vessels gradually contract and their orifices are closed the blood in the lochia grows less, until at the eighth or tenth day in the primipara, and sometimes as early as the third or fourth day, it disappears. In the multipara the blood continues to flow longer, often for two or three weeks, and occasionally even longer than this. As the blood grows less in the lochial discharges it is mingled with a perceptible quantity of serum and mucus, and finally pus. The thin and white portions preponderate, and are finally the only parts observed in the discharge. At first the lochia has no smell but such as arises from the odor of the blood and the genital mucus; but in the course of twenty-four hours, or something later, it is stronger, and even becomes fetid. This fetor has been described as peculiar to the lochia, but I have not been able to detect any difference between the odor of the lochial discharges and the decomposing blood furnished by the genital organs under other circumstances. The flow of the lochia is sometimes lessened very decidedly during the few hours that the milk fever continues.

AFTER-PAINS

Are the pains that immediately succeed the delivery of the placenta. Sometimes, but a few moments after the placenta has been expelled, the patient experiences a recurrence of pain, and it continues to recur at intervals, sometimes brief and sometimes more extended, for one, two, and often several days. They are sometimes very severe, causing the patient to suffer almost as much as the pains of labor; but usually they are much more moderate, giving the patient but little inconvenience. Multipara have them worse than primipara; indeed these last have them so slightly as to be scarcely noticed. These pains are the same in character as labor pains, and are connected with the uterine contractions. They produce the effects of lessening the size of the uterus, and expelling clots of blood that would otherwise remain in the uterine cavity and undergo decomposition. The difference in the distress entailed by them would seem to depend very much upon the number and size of the clots in the uterine cavity to be expelled, and the difficulty with which they escape from the os uteri.

Although the conditions of the breasts form an important part of the puerperal condition, I have reserved the subject of milk fever, and the changes going on in them, for separate attention.

MANAGEMENT OF THE PUERPERAL CONDITION.

The reader will not fail to see in the description of the puerperal condition I have just given, a physiological condition that very much increases the susceptibility to morbific causes. A very plausible mode of reasoning is occasionally employed to prove that the puerperal condition is one of much less importance than accoucheurs are in the habit of attaching to it. The main ideas entertained by gentlemen who thus consider the subject are, that it is a physiological or natural condition, and physiological states are never even predisposing causes of disease. Whatever might be the condition of human beings under an entirely natural mode of life we cannot now judge, as but few examples present themselves to the observation of intelligent and capable medical men, and from these we cannot now form an opinion. I am satisfied that this is not the only physiological condition that—to speak in a temperate manner—renders the system very susceptible to morbific agents, as we meet with them in civilized and enlightened society. And this puerperal condition not only renders the patients susceptible to the effects of morbific causes, but so modifies their effects as to give rise, as a rule, to the most appallingly rapid and destructive affections. Hence the duty of those in attendance upon lying-in women to place them under the very best hygienic circumstances. It is a fortunate truth that the intensity of the different items of this puerperal condition is very slight in the great majority of cases, and therefore but a small per cent. of the whole number of lying-in women suffer more than temporary inconvenience. Yet statistics prove that a great many die of diseases traceable directly to, and many more that are rendered dangerous only by, the puerperal condition. Dr. Thomas has collected a large amount of statistic statements, going to show these facts in a strong light, to which I would refer the reader (*Richmond and Louisville Medical Journal* for February, 1869). A large airy room should be selected for her accommodation, and ventilation should be as free and perfect as possible, and when the weather is cold the artificial warmth of fire and clothing, if properly employed, will enable us to keep up the proper temperature and her to have plenty of fresh air. The room should be situated so that the patient can be kept quiet and secluded if her condition require it. Perfect cleanliness is another important part of the hygienic management of the lying-in room,—cleanliness of the house, room, bed, and person of the patient, so that the health of the patient may not be injuriously influenced by the poisonous exhalations or gases of any kind whatever. The more immediate attention to the patient must be regulated very much by her particular condition. Many patients will pass through the ordeal of labor and emerge from it with scarcely any appearance to indicate the fact a few hours afterwards. They feel and express themselves as feeling able to get up—and some of them actually do—and attend to their ordinary avocations, while others are exhausted, lame, and exceedingly depressed. It would be irrational to confine the former class to the strict regimen required for the welfare of the latter, and we ought to accustom ourselves to discriminate between the conditions and requirements of the lying-in room. One of the first things that will require the attention of the attendant, of much importance, is to have the patient covered up warmly immediately after the fœtus is expelled, before any chilliness is experienced, with a view to moderate the influence of the centripetal tendency of the circulation. We should make ourselves acquainted with the former condition of the health of our patient, in order to be guarded against any difficulty that might arise from previous circumstances. The practitioner should not allow himself to leave the bedside of the patient under an hour, as some of the hemorrhages that are so destructive to this class of patients make their appearance before that time. After having assured ourselves that the uterus has contracted well, and the bladder is not distended, we may, if there is nothing unusual in the case, after having waited an hour or more, take our leave. If a patient gets over the first twelve hours after confinement without difficulty, we may feel pretty secure against one of the most disastrous occurrences, viz., hemorrhage. We should visit our patient within twenty-four hours. In addition to noticing her pulse, which we should not fail to observe with some care, we must inquire into the state of the bladder, by asking the nurse and patient with reference to it, and also by touching, and, if need be, looking at the hypogastric region. It is not unfrequently the case that, in consequence of pressure upon the urethra or meatus urinarius, tumefaction and sensitiveness are produced in one or the other place to such a degree as to prevent the evacuation of the bladder. Or the distention may have been considerable, and the pressure upon the vesical nerves been so great as to partially paralyze the muscles of that organ, and thus render it incapable of expelling its contents. In either case there will be retention, and it will be necessary to use the catheter to remove the urine.

In considering the necessity of the use of the catheter we should remember that, in consequence of the great activity of the skin during labor, and sometimes for a day or two afterward, the water discharged by the kidneys is not as great as usual, and that the bladder may not be very much distended although not evacuated for twenty-four hours. This matter can be easily decided by the examination I have recommended, when the elastic and fluctuating tumor above the pubis will not be mistaken for the hard resisting tumor of the contracted uterus. If the bladder is not evacuated voluntarily, it will be better, as a general rule, to use the catheter once in twelve hours. Where this must be repeated for a number of days it becomes an irksome, and is sometimes an impracticable duty, from distance or press of business, to the medical attendant, and it may be intrusted to an intelligent nurse, after we have carefully instructed her and seen her introduce it. It sometimes becomes a question, when difficulties arise in evacuating the bladder, whether the patient may assume the sitting posture the more easily to accomplish this act. Without there has been unusual prostration, I can see no objection to assuming a position on the "chamber" in the bed. While thus temporarily relieving our patient we should endeavor to remove the condition upon which the retention depends. If it be urethral inflammation, fomentations and emollient applications and lapse of time will relieve it. Should it, however, depend upon partial paralysis, more difficulty will be experienced in removing it. In the beginning I am in the habit of using ergot to restore the tone of the muscles, or if from want of nervous energy, strychnia. Should it persist after the first two or three weeks, the local application of electricity will sometimes cure the difficulty. Although generally a trifling affair that is readily gotten rid of, this paralysis, on rare occasions, is very persistent under the most judicious treatment. If the bowels have been properly cared for previous to confinement, they will require no attention for two or three days, and then, if there is an evacuation in that time, nothing of course need be done. But if they have been much constipated an injection on the third day will be very proper. On the morning of the fourth day, if the bowels have not been moved before, an injection, Seidlitz powder, or citrate of magnesia may be used to procure an evacuation. I prefer injections, when they are sufficient to answer the purpose. The diet of the lying-in woman must be regulated by circumstances. If the digestion is good, no special tendency to inflammation, and the patient feels well and comfortable, her diet need not be changed from what she is in the habit of using. But if the labor has been protracted and the powers of the stomach have been impaired, the diet should be suited to its debilitated state; then, however, it should be as nourishing as the stomach will digest. I do not believe there is anything gained by giving meagre diet to prevent inflammation, or that there is danger of inducing a condition of the system in which it will be more destructive, for the better nourished and the more perfect the state of nutrition, the more controllable inflammation is when it does occur. But the spare diet so generally prescribed for a lying-in woman has the effect of starving her into a state of prostration that makes her more feeble and less capable of rising from her bed at the end of nine or ten days than at the day of confinement. I am therefore in the habit, in my own practice, of allowing my patients their usual diet, both in quantity and quality, unless some special reasons exist for a different course that would induce me to modify it under other circumstances. The same considerations cause me to allow them any of the drinks to which they are habituated, cold water, coffee, tea, and other similar simple drinks. There is no rule that can be constantly applied with reference to the time the patient should be confined to the recumbent posture in bed. Patients who feel well and strong need not be confined to the recumbent posture absolutely; they may be allowed to sit up in bed, and even in an easy-chair, for a short length of time each day from the third day. The reasons for the recumbent posture the first two or three days lie in the danger of hemorrhage, or at least more profuse discharge of lochia. At this time there is no danger of prolapse, because the uterus is too large for anything of this kind, as it would extend from the perinæum to half way to the umbilicus. So far as prolapse or any kind of displacement is concerned, there is more danger from the ninth day forward than before, because the uterus continues heavy for several weeks, and is only in a condition not to be influenced by the erect posture after the lapse of six to twelve weeks. Too much exertion, or too long a time in the erect posture, is promotive of inflammation and permanent congestions, so that when patients are ever so well they should return to their ordinary duties slowly. Some patients can as well leave their bed on the fifth day as many others can on the fifteenth. Patients who are much prostrated by labor, or to whom more than ordinary damage has been done, should be managed with reference to these facts, and should not be allowed to rise from their beds until recruited from them. The genital organs should be thoroughly cleansed externally and internally, externally by washing with soap and water two or three times in twenty-four hours, as the condition of the discharges would seem to require. And after the second day the vagina ought to be washed out thoroughly, but gently, by means of syringe or siphon, with soap and water twice a day, and if the discharges are very fetid the soap may be replaced by carbolic acid or chlorinated soda. These injections should be continued until the lochia entirely ceases. Another subject of no small interest to the woman, is what shall be done for the after-pains. Remembering that their effects upon the uterus and its discharges are beneficial, we should not unnecessarily interfere with them. If the patient can bear them without too much nervousness, if they do not interfere with sleep, or derange the nervous functions too much, we ought not to give anodynes for their relief. But if the patient cannot sleep, and they depress the nervous energies, we must relieve the patient from their effects. Camphor and opium are the only reliable means for this purpose. One to three grains of opium, with two of camphor, given every four or six hours, is an efficient combination for them. Camphorated tincture of opium, in doses of from half an ounce to an ounce at a dose, repeated once in four hours, or at less intervals, is an effective remedy for them. I do not say that hyoscyamus, chloroform, or other narcotic or anodyne will have no effect in relieving after-pains; but I am positive that they have not been satisfactory in my practice, compared to camphor and opium, given either separately or in combination. Much importance is attached to the continuance and moderate profuseness of the lochia; the people cling to the obsolete idea of their cleansing character, and think that if the woman does not have at least a tolerably free discharge of lochia for nine days or more, there is danger of subsequent serious consequences. Eruptions, inflammation, and in fact almost all the ills that befall a woman who has not been thoroughly cleansed, according to this idea, are attributed to this deficiency. This of course is an absurdity, and it does not matter how soon the discharge ceases. If it is not attended with symptoms at the time, we need fear no consequences in the future. But there is such a thing as suppression of the lochia, and it always signifies mischief. It is only significant of disease, and does not cause the disease. It is associated with inflammation of the uterus, and accompanied with deep-seated and dull pain and tenderness in the region of the uterus, with fever and other evidences of uterine inflammation. When this condition is first observed we may often correct it by using fomentations over the uterus, or the application of a hot poultice of linseed meal mush over the whole lower part of the abdomen, and the administration of some diaphoretic but not stimulant drinks. Should this fail to accomplish the desired results we have an established inflammation of the uterus, of greater or less intensity, and must treat it as such. The lochia are sometimes retained in the uterus. This usually occurs early, the next day or very soon after delivery. The flow ceases, and the after-pains increase in severity, if they existed before, and if not, pains begin of the same alternating character, and grow in their painfulness and distress until the patient is in great agony. At first there is no fever or chilliness, but after a number of hours the patient is often seized with rigors, sometimes very severe. The uterine globe is enlarged, and also quite tender to the touch, and if we observe it closely it may be observed to contract at the time the pain is greatest. We may diagnosticate this condition by examining the cervix uteri per vaginam. The os is found closed by a firm coagulum of blood, or by a strong membrane stretched across it, so as to prevent the blood from flowing out. It is generally sufficient to break up the obstacle, whatever it may be, and allow the flow to be established, and keep it so by preventing the recurrence of the occlusion.

MANAGEMENT OF THE BREASTS.

Early in pregnancy the breasts begin to undergo the development necessary to prepare for the discharge of the function of lactation. By the end of the third and commencement of the fourth month there may be a serous fluid pressed from the nipple, and at seven months the milk is found, so that upon squeezing from the milk-duct it looks white and has some consistence. At term there is generally quite an appreciable quantity. This first milk, called sometimes the colostrum, contains a large portion of saline ingredients, and when taken by the infant soon after birth acts as a laxative. If the child is put to the breast, and the office of nursing immediately begun, the glands are stimulated to secretion at once, and the amount of this fluid is gradually increased until there is an adequate supply; but if, under a mistaken idea that there is no milk for the child, or that the first secretion is not good for it, the breast is withheld, the full secretion is not produced for two or three days, when violent congestion of the breasts occurs, attended with the phenomena of milk fever. Although milk fever does occasionally occur when the child is nursed from the first few hours after the delivery, this is not usually so, and when it does the symptoms are comparatively mild. On the third or fourth day after confinement, therefore, we may expect more or less febrile excitement, sometimes very violent. The patient is seized with severe rigors and sense of chilliness, with great thirst, dry mouth, rapid pulse, not unfrequently the pulse rising to 140 in the minute; the head aches fearfully, and all the limbs are very painful; delirium sometimes shows itself in severe paroxysms. This chill is followed very soon by an intense hot stage that lasts for from two to ten hours, when the sweating stage brings sudden and gratifying relief. During the time of these general symptoms the breasts are quite decidedly affected. They at first feel sensitive and hard as the febrile stage approaches, then become greatly swollen and hot; the lobes of the glands are strongly marked and hard, and still more tender to the touch. During the sweating stage they become softer, the hard lumps, if they do not entirely disappear at once, become less distinct, and the tenderness has pretty well passed away and become replaced by a sense of fulness and tension, and very soon the milk begins to flow from the nipple, indicating the establishment of the secretion. Sometimes, instead of the fever running this rapid course and subsiding, it is protracted, and the subsidence is imperfect. This is caused by an imperfect subsidence of the congestion of the breasts, and should lead us to apprehend inflammation of the organ. When the patient is seized with milk fever she should be covered warmly in bed and remain as quiet as possible until the whole of the different stages have passed by, and for two or three days she should avoid cold, lest inflammation should be awakened in the mammary gland. The reader will understand that this milk fever is symptomatic of the congestion of the breasts, and that when it pursues an ordinary course there is no need of interference in any manner except to keep the patient comfortable. It will be seen by what has been said, that it is better the child should be placed to the breast within a few hours, because we avoid the milk fever and the consequences to the breast that sometimes result from it, and for the welfare of the child. What follows of the diseases which occur to the breast after delivery is extracted for the most part from my recent work on the Medicine and Surgery of Women, and I trust will be sufficiently full to answer the purpose here.

Inflammation of the Nipple.—This may be accompanied with abrasions, fissures, or ulceration. Abrasion is most frequently seen on the apex of the nipple, and is the condition in which the delicate epidermis is removed by action of the child's organs in sucking, leaving the dermis naked, bleeding and raw. It may, however, be observed on any part of the nipple. Not unfrequently these abrasions are increased in depth by ulceration, until a greater or less portion of the nipple may be destroyed. Cracks or fissures likewise often affect the nipple. These cracks are located either on the top, sides, or at the base of the organ.

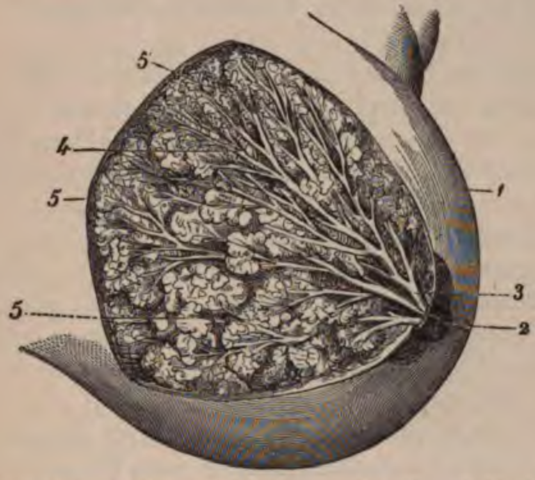


FIG. 109.—SECTION OF THE BREAST.—1. Cutaneous Envelope. 2. Nipple and Areola. 3. Lactiferous Tubes and Reservoirs. 4. Tubules of a Lobule. 5. Lobules of the Gland.

The apex of the organ, sometimes, is so deeply fissured as to lay it open to the bottom of this projection, and leave it split in halves; but the fissure is usually much less extensive, and simply lays open the top of the nipple to the depth of the skin. The worst fissures that occur on the nipple, however, generally more or less completely encircle the base of the organ. To such an extent are fissures of the base sometimes carried by ulceration, as completely to amputate this little projection. Abrasions and fissures lead almost invariably to ulceration, and we may consider these as the first stage, so to speak, of ulceration.

This ulceration, of course, resulting as it usually does from abrasions and fissures, occupies the place which I have assigned to them.

The symptoms which accompany these three conditions of the skin of the nipple do not differ each from the other, and without inspection we would not probably be able to distinguish between them. There is great pain upon handling the part, or when the child sucks; indeed it is so very severe as to render it entirely intolerable to the patient, and cause her to resist every request, or even command, to nurse the child. When the child is put to the breasts, in addition to the pain, they bleed so as to disorder the milk, and sometimes sicken the child and cause it to vomit up the contents of the stomach. The extent to which ulceration may proceed under the irritating influence of nursing is sometimes very great.

I remember an instance in a patient affected with stomatitis materna, when the nipple was completely destroyed, and the place where the nipple had been, excavated below the surface before ulceration was arrested. Every experienced physician must have seen cases where the nipple was cleft, cut off, or very badly mutilated. Ulceration has its origin in many cases, also, in small phlegmonous inflammations of the cellular tissue of the nipple. It not unfrequently happens that small pimples arise, suppurate, burst, and, on account of the constant irritation of nursing, remain open and pass into a state of ulceration, which is often very obstinate.

Small ulcerations occur in the same way on the areola occasionally, but not with anything like the same frequency as in the nipple. Neither are they generally so painful as when upon the nipple. The parts being less firm, the swelling does not press upon and distress the surrounding parts so greatly. Such diseases of the areola get well much easier than those upon the nipple, because they are less disturbed than in that place by the child when sucking.

Milk Abscess.—Passing to the deeper structures of the breast, we encounter inflammation of the containing portion of the mamma, the expanded milk tubes, the milk reservoirs. There are from fifteen to twenty-five of these expanded tubes, holding from two drachms to an ounce each, in the natural condition. They are separate and distinct, each tube representing a lobe of the gland. One or more of these may inflame, ulcerate, and discharge the milk, mixed with greater or less quantity of pus. Inflammation, followed by ulceration and discharge of pus and milk of these reservoirs, is alone what should be called milk abscess. Abscesses from this part of the breast do not occur singly, as a general thing; several are going on at the same time, one arriving at the ulcerated stage after another: so that we have a succession, each abscess involving one tube, and sometimes, but not often, more. They are seated under the anterior surface of the breast, mostly within an inch of the areola, and sometimes under it. In some persons the reservoirs are large, extend a considerable distance in every direction from the areola, and overlay the gland almost to the margin of the mamma. Milk abscesses need not necessarily be near the central portion of the organ, although they generally are not far from the areola. They usually proceed somewhat slowly, taking longer to arrive at the suppurative stage than in superficial phlegmon. Swelling and tenderness are felt near the areola; it increases steadily until an apex is observed in the tumor; the integuments are thinned, fluctuation is observed, and rupture follows. This process requires a very different length of time under different circumstances. If the milk is secreted rapidly, the tube is distended faster; if secretion is scanty, the advance is slower. The inflammation depends upon distention of the reservoirs by milk which cannot find its way out of the milk tubes. Retention of milk is caused by several different circumstances, which I shall have occasion to mention after a while. I wish now to be understood as saying, that it is the essential cause of the inflammation in this form of disease. The milk is secreted, but not eliminated, from the reservoir affected; it acts as an irritant by its great accumulation, until inflammation is the result. The secreting capacity of the organ is not necessarily disturbed, and the excretion of the milk may be ready and easy through all of the tubes whose reservoirs are not affected, and we may think it is being evacuated entirely, while it is retained in one or more reservoirs by the stoppage of the nipple tubes. When evacuation, either spontaneously or by the lancet, is effected, pus and milk flow in moderate quantities at first. The pus gradually diminishes, the milk becomes more pure, until a milk fistula occurs, which lasts a greater or less length of time. Should the eliminative tube become open, and allow the milk to flow from the affected reservoir through the nipple, the adventitious opening may entirely heal, and the integrity of the part be restored; but, as is most frequently the case, the fistula remains open until the breast ceases to secrete all the milk produced by the lobe whence the reservoir is supplied flowing out at the place.

Sometimes, again, after breaking and discharging it suddenly heals up, distention recurs, and the process of ulceration and discharge is repeated.

The sympathetic symptoms are not generally so great as in some other varieties of mammary inflammations. Fever does not run so high, aching of the head, limbs, etc., does not distress the patient so much. Yet they sometimes are quite considerable, and require alleviation by appropriate remedies. The damage done to the breast by inflammation attacking these parts is not so great as results from glandular inflammation generally, though I have known instances in which nearly all the reservoirs were destroyed, and the breast henceforth remained useless. One of the worst features of the case is derived from the persistent repetition of abscesses, wearing out the patience of the medical attendant and the powers of endurance of the patient. It is always complicated by disease or deficiency of the nipple. Besides this ulceration or phlegmonous inflammation of the milk reservoirs, there is another form in which blood and pus are discharged through the nipple tubes, the passage from them being free. Very few experienced physicians but what have seen this discharge of pus, blood, and mucus from the milk tubes, with tenderness and some tumefaction under the areola. It is generally considered to be an abscess discharging in this way, but it is ordinary inflammation of the lining membrane of the milk reservoirs discharging its products through the nipple. Abscesses occurring as the effect of overdistention of the reservoirs, do not give origin to those deep ungovernable sinuses that sometimes trouble us in glandular inflammation, and while there is often milk fistula following them, these close as soon as the secretion ceases, and we have no further trouble.

Several times in my life I have met with these abscesses during pregnancy, in which the accumulation of pus and milk was very great, so that when they are opened many ounces of pus and imperfectly formed milk were discharged. Several months since I was called in consultation in a case in which the disease had begun three months before labor, and when I saw her the child was two months old, and large collections of pus and milk existed, pent up in the reservoirs of impermeable tubes in both breasts; and while some of the reservoirs contained and their tubes discharged milk upon nursing, half of them were the subjects of purulent inflammation. Generally the inflammation which causes the evacuation of the milk and pus checks the secretions of milk, and the patient recovers before the time for labor. This is fortunate when it occurs. According to my experience, this is the most common of mammary abscesses; indeed I think by a large majority.

Glandular Abscesses of the Mamma.—This is the most grave of acute inflammation of the breasts occurring during lactation. I am not aware of ever having seen an instance of mastitis proper, unless caused by violence, in any other than nursing women. When the inflammation takes place early in nursing, it usually comes on about the third or fourth day. Mastitis cannot, in the first few hours, be distinguished from the intense congestion which occurs at the time the secretion of the milk is first produced. In either case the woman is seized with a severe chill, in which it is not uncommon for her to shake and chatter as in a violent ague. In the course of an hour, or sometimes longer, sometimes in a few minutes, the chill gives place to a violent reaction; a high fever, pain in the head, limbs, back, and often abdomen, annoy the patient. All the phenomena of severe inflammatory fever occur. When the congestion subsides into a copious effusion of milk in the cells of the gland, the fever declines, a copious perspiration appears over the whole surface, and comfort succeeds great uneasiness, and sometimes alarm.

When, however, the gland is not completely relieved by secretion, this transition from a state of febrile reaction is imperfect, and the patient left with more or less of the symptoms of fever.

Simultaneous with these general symptoms there is pain, tumefaction, tension, heat, and tenderness of the mamma. If the secretion is established, the breast, as the sweating stage advances, becomes soft, cool, and less sensitive, until it is entirely comfortable. On the other hand, if inflammation is to succeed this congestion, some part of the organ is left in a hard tender condition. A hard lump of greater or less size continues to occupy some deep portion of the breast. Tenderness, tumefaction, heat, and redness increase until inflammation is permanently fixed. Without early, energetic, and appropriate treatment, the woman will lose part of the mammary gland by destructive suppuration.

In the beginning of glandular inflammation, if the part be attentively examined, the shape and position of the lump will enable us to determine the seat. It will be either deep in the central portion of the breast or in the marginal region. The tunical part is irregularly lobular, depressions and elevations may be observed, nodulous, not sharp ridges. Very soon after the inflammation begins, particularly should it be advancing, this nodular feel is merged in diffuse hardness of the surrounding parts, until the whole tumor may become smooth and irregularly defined. Inflammation, hardness, and tenderness increase for a few days, when the centre becomes slightly soft at first, growing more so until distinct fluctuation is perceived.

At this time we find a soft fluctuating locality completely margined by hardness all round. This then will be the feeling of a mammary abscess, whether acute or chronic. Glandular abscess differs from milk abscess by being at first much deeper, having a covering of integuments, etc., half an inch or more in thickness, while the milk abscess, though quite hard, seems to be immediately beneath the integuments. When fluctuation is *first* perceptible in milk abscess it is shallow; in mastitis it is deep and makes its way slowly to the surface. When pus arrives at the surface, and ulcerates through or is evacuated by the lancet, its flow is much more difficult and the evacuation less complete; relief is not so sudden and perfect. Extensive destruction takes place both in the internal portions of the organ and in the integuments. And so tortuous and irregular are the tracks of transit, in some instances toward the skin, that the pus finds its way out with so much difficulty that the sinuses are sometimes extremely difficult to heal. This state of things may last for many weeks and even months. We not unfrequently find cases in which these sinuses are numerous, tortuous, and lengthy, so as almost to riddle the internal of the organ, and discharge large quantities of pus, thus draining the system of the woman, inducing hectic, exhaustion, and, in extreme cases, death.

Often, instead of beginning at the time of puerperal congestion of the mamma, mastitis shows itself late in lactation. When occurring at such times it may spring up suddenly, inducing all the general phenomena above described in a greater or less degree of intensity; or it may be slowly established, and not bring the system into so decided sympathy and perturbation. Yet in the latter case, as the inflammation becomes more completely established, fever is pretty certain to be manifested, its intensity being greater or less according to the extent of tissue involved, the rapidity with which it advances, and the susceptibility of the patient. The first thing noticed, perhaps, is what the woman would call cake in the breast, of moderate, yet decided tenderness.

This consists in inflammation in one or more lobes of the mammary glands. It gets worse, the swelling becomes greater, tenderness more considerable; instead of the well-defined nodular tumor, the swelling is more diffuse; other parts are involved—the areolar tissue around the gland; redness in the skin is observed; sympathetic fever sets in, and then it passes through the different grades above mentioned in the acute variety, with less intensity.

Causes of Mammary Inflammation.—The physiological congestion preceding and accompanying the commencement of lactation, very frequently is carried too far, and merges into pathological congestion, and this again into inflammation. When inflammation arises from this cause, it will almost invariably be mastitis or glandular inflammation. This sort of congestion may occur later, but usually it is in the puerperal condition. Another sort of congestion, which often runs into inflammation of the glands, is brought about by sexual intercourse in very excitable nursing women. I think I have known several instances of this kind. Other passions, as anger, may be succeeded by like results. Vascular excitement from stimulants will endanger the breasts in puerperal women also. External causes may give origin to similar sorts of inflammation, as bruises from blows, tight lacing, stays of whalebone, etc. These last are productive of a good many cases. Not unfrequently our patient gets up well from the effects of labor, and the first time she dresses to go out, pinches her excitable gland with lace-strings, or punches it with the end of a piece of whalebone during the whole of her round of fashionable calls, and comes home with the breast excited to inflammation. Cold acting partially upon the person, as the feet, the breasts themselves, or even upon the general surface, repels the blood to the already blood-loaded gland, and produces congestion as the first step of inflammation. Other external causes operate upon the nipple and surface of the breast, irritate the skin, or destroy its integrity, etc. The child often sucks off the epidermis, and by thus abrading the nipple ulceration is brought about.

Allowing milk or saliva to remain in contact with the delicate skin of the nipple or areola long enough to undergo decomposition, too often is the cause of ulceration, more especially when the saliva of the child is rendered poisonous by the existence of aphthous incrustation upon the tongue, gums, and roof of the mouth. The cracks so often found upon the nipples, I think, are almost invariably produced by the habit of allowing the fluids deposited upon the delicate skin to slowly evaporate, and thus carry off or otherwise neutralize the sebaceous unction of these parts, which is intended to keep the cuticle pliant and soft.

There is a class of causes which I am disposed to call pathological, very prolific of grave mammary diseases. One affection may act in producing another. Thus ulceration of the nipple prevents proper efforts to draw the milk from the reservôirs; they become distended to a degree that causes inflammation; or the ulceration on the top of the nipple, by the swelling it causes in the inter-tubular tissue, lessens the diameter of the tubes, or entirely closes up their mouths, so that milk cannot find its way out or be drawn; accumulation results, and inflammation follows. Cracks, of course, will do the same; or again, the inflammation originating on the nipple may creep down the lining membrane of the milk tubes into the reservoirs, or even farther, through the ramification of the radicles of these ducts, to the substance of the gland itself. In either of these localities suppurative inflammation may arise, and proceed through all its most aggravated forms. Contiguity of inflamed parts may awaken inflammation in other parts. Integumentary inflammation may extend to the reservoirs or glands, by spreading from one tissue to another. There can be but little doubt that acute, and in most cases chronic inflammation of the lymphatic glands, is generally secondary to inflammation and ulceration of the nipple and areola. It would probably be too strong an assertion to make to say that inflammation of the lymphatic glands always has its origin in this way; for in cases of strong predisposition to this disease—and there are numerous instances of that kind—it would probably arise without much cause of excitement. Certainly I cannot be mistaken in supposing that I have seen several such cases.

Anatomical causes of inflammation of the breast exist to a great extent. They are sometimes congenital and hereditary, but I think for the most part brought about by improper dressing. The flat, undeveloped, or retarded nipple is one form of anatomical peculiarity which prevents the perfect performance of suckling; a very broad but extremely short nipple, entirely too large for a child's mouth, and so short as to add to the difficulty of prehension; a breast with scarcely a trace of the peculiar warty tissue; like nipple, and pouched slightly where the nipple ought to be, a very small nipple, where the milk tubes seem to be bound in such a contracted bundle as not to allow free egress to the milk, are almost impracticable. The first and third, quite so; and the second and fourth so difficult that we are generally driven to the necessity of abandoning it after the best directed efforts to make the breast available. The danger to breasts furnished with such nipples is, that the milk will not be properly evacuated, and that milk abscess will result. There is another nipple, large enough to be easily apprehended and drawn by the child, but it is too constricted at the base. The milk tubes, upon entering it, turn too acute an angle; a little swelling of the sub-areolar tissue from retention of the milk will stop them entirely up, so that the milk will not pass out. The model breast has a nipple slightly conical, the base being larger than the apex. The milk tubes are free from pressure everywhere. Their entrance into the nipple is by a slight curve instead of an angular turn. The milk will flow spontaneously from this kind of breast, and there can be no accumulation in the reservoirs. There is no lodging-place; the nipple would be wiped clean of all these accumulations by the mouth, and return of the breast inside the clothing of the mother. The shape of the mamma may predispose it to disease, but not in so striking a manner. The more conical a breast the better. A flat sessile mamma is more likely to inflame. Although the above mentioned varieties of nipples are not the only ones predisposing to mammary abscess, yet by drawing the attention of the profession to the subject thus distinctly, it is believed there will be no difficulty in recognizing adverse anatomical peculiarities whenever they do occur.

Treatment.—I can better give my views of the treatment of the affections above described by observing the same general division with reference to the application of the processes of cure. Inflammation of the nipple will come up, in this order of the arrangements for consideration, first. Our means of cure for mammillitis should be arranged under three different heads, as follows: Prophylactic, palliative, and curative. The first have for their object the preparation of the nipple for the trials through which it has to pass at the time of nursing. As has been seen, the causes operating upon it produce abrasions or chaps, and their action is greatly facilitated by the natural and acquired tenderness of the structure, particularly the epidermis and skin. The prophylactic means to be used are such as harden these. As elsewhere, so in the nipple; the skin becomes tough, and the epidermic scales abundant and adherent, upon exposure to air and friction. The contrary condition will obtain—tenderness, etc.—from pressure, and covering with impermeable or large quantities of goods. In this condition it is protected by extraneous covering, and hence does not furnish its own proper defence. The epidermis will be thin and light, and the skin tender. The nipple, therefore, should be covered lightly during pregnancy and nursing. The thinner and more permeable the covering, the better. It should be of such a character as freely to admit the air. At the same time, it should be subjected pretty constantly to moderately rough friction.

An excellent dressing for the nipple for the last two months is a rough coarse sponge, so cut as to cover the areola, surround and cover loosely but touch every part of the nipple. Over this there should be but one thin thickness of goods, so as to allow of the evaporation of fluids as fast as secreted, and the free admission of atmospheric air. In cold weather, when going out, the breast of course would be covered by all the over-clothing that is used for the protection of other portions of the person. It is a great mistake to cover these important organs—important on account of their usefulness instead of their beauty—so thickly as they usually are; they bear exposure with great impunity. When we wish to harden the nipples, we should bear in mind the circumstances which harden our hands, and make use of them; we should equally avoid the circumstances that soften our hands. When a lady wishes to soften and whiten her hands she wears kid gloves, and does not allow them to touch hard substances. In like manner she may soften her nipples, if she should wish to do so. To occasionally moisten them with water and allow it to evaporate slowly on exposure to air is a good expedient; friction with a dry towel or the fingers will assist in the process of hardening. It is a matter of great question, whether the various washes used to harden the nipples are not injurious instead of beneficial. They generally exert a chemical as well as physiological effect, while this last is all that is desired. During lactation the same exposure to air and lightness of covering should be observed, and after nursing the nipple should be wiped clean and dry before being returned under the clothing. This is a rule that should never be neglected. Those who have observed the effect of allowing the udder of a cow to dry spontaneously after the calf is taken from her, will understand the importance of attending to this matter. It will be all the better to use a little glycerine or very fine olive oil after they are dried each time, particularly if we have reason to apprehend danger of chaps or cracks. Such prophylactic measures will very generally enable us to avoid the occurrence of distressing chaps or cracks. When, however, the nipple becomes inflamed, these are not sufficient to satisfy the demands of the case, and we must resort to palliative and curative measures; and first of the palliative. As the nipple must be used in order to preserve the function of the breast, and as every time the child sucks the healing processes that have begun must be more or less interrupted, it becomes important to procure such means as will preserve the breast from the effect of these interruptions as much as possible. The chaps and abrasions that occur, and give rise to inflammation and ulceration, may be located anywhere upon the nipple—at its summit, sides, or base—and when the child nurses, the tongue and labia embrace it so closely that none of these places escape. The artificial means used to palliate the effect of sucking intervene between the mouth of the child and the nipple, and should be selected with special reference to each case. The shield of ivory or britannia answers very well when properly managed. They are made in the form of a conical hat, having a rim, a crown cavity, with a draught tube rising out of the top for the milk to flow through. Now, having in mind that these three parts must vary in length and size for different-shaped nipples, and cases in which the locality of the abrasions or chaps are different, we will have no trouble in making a profitable selection. The rim should be large enough to cover the areola, the crown or nipple cavity large enough to pass over the nipple, merely touching it on the sides. These things should be observed in all cases. The depth of the nipple cavity is a matter of the greatest importance. If the abrasions or chaps are on the summit of the nipple, it should be so deep that when drawn the top of the organ will not touch, or else it will cause pain. There should be no pressure on the top. But if the cracks or abrasions are on the sides or at the base of the nipple, then the cavity of the shield must be shallow, so that the top of the nipple touches its bottom in such manner as to prevent stretching the organ, and bring the pressure on the top altogether. In this latter case the bottom of the cavity should be smooth as possible, and correspond in shape to the summit of the nipple, in order to prevent unequal pressure. The shield, of proper shape, size, etc., will afford great relief to the patient, and prevent very much the disturbance to the healing nipple. It is not a matter of indifference either, what material we use as an envelope for the shield. Gum elastic or cow teats are always clumsy, and easily become foul or hard, and sometimes taste, in spite of our best efforts. Now I cannot avoid the conviction that a soft linen rag, properly adjusted over the draught tube, is better and cleaner than any other envelope. It has the advantage of being cheap and always at hand, so abundant that it may be replaced by a new one after each operation of sucking.

But a very ingenious contrivance is mentioned by M. Legroux which is as follows:—

℞ Collodion,	ppts. xxx.
Ol. Ricini,	" ss.
Ol. Terebinth,	" iss.

Mix. This is a fluid mixture which is quite adhesive, and dries less quickly than collodion. It is applied upon the areola with a brush, so as to encircle—but not touch—the nipple the width of an inch. While yet soft the nipple is covered by gold-beater's skin, and pressed well down around it upon the mixture. The skin adheres to the adhesive material, and thus forms a perfect, smooth, and pliant covering to the nipple. All that remains to finish is to prick several holes through the gold-beater's skin with a needle, to let the milk through. This has the advantage of not changing the shape, size, and feel of the nipple to the mouth of the child, so that it sucks more readily than it would an artificial nipple made with a common shield. But while this is the case, it allows the pressure of the lips upon the nipple at every point, and only partially relieves the mother from the pain.

In the most of cases I would rely more upon the judicious selection and management of a shield than this contrivance, ingenious and neat as it is. This may be imitated by other adhesive mixtures and tissues. Before sucking, the gold-beater's skin must be moistened with a little sugar and milk. Much of the suffering under nursing, while the nipple is raw from chaps, abrasions, or ulcerations, may be avoided by being drawn by the mouth of an adult, so shaping the vacuity produced for the purpose of drawing as not to touch the sore part. If the lips are so placed around the nipple as to press upon the areola, and not touch the nipple more than very gently,—and I am sure this is practicable by any intelligent adult who will make a persevering trial,—the draught can be accomplished with comparatively little pain. Violent action should not be used; a gentle but constant pressure with the lips on the areola, with persevering but very gentle draught, will usually suffice, and powerful suction is sure to aggravate the cause of the retention of milk. I have often sat down, and by encircling the nipple with my fingers without touching it, and pressing upon the areola, caused the milk to flow freely, when with great difficulty it could be drawn out. In thinking upon this subject, we should remember that it is the pressure of the atmosphere upon the outside of the breast, combined with the elasticity of the integuments and coats of the milk reservoirs, that urges the milk forward through the nipple into the vacuum caused by excluding it from around the top of the nipple. The vacuum will not be necessary, if the pressure can be made with sufficient firmness without injury of the part. Why cannot some ingenious individual invent a milking apparatus of gum elastic, that will press upon the areola and front of the breast, without causing a vacuum on the nipple? This would often save a great deal of trouble and suffering to our lady patients. In thus viewing and treating the subject, we would push the milk out, instead of, as we upon a superficial look at the matter suppose, pull it out.

The above palliative means do not enable us to *avoid* the causes of inflammation of the nipple; but by their use we may render the operation of them less mischievous, which is often sufficient in favorable cases to effect a cure. In considering the curative remedies for sore nipples, I must protest against the simplicity with which we use the word and think of sore nipples. We speak and think of it as though there was no variety of sore nipples. The same treatment is not applicable to abrasions that is to chaps or cracks, nor to ulceration, nor to all the conditions of ulceration. Nature tries to cure cuticular abrasions by an effusion upon the naked surface of a viscid albuminous layer, thus defending the delicate tissue from contact with atmospheric air or other irritating substances, and if this is allowed to remain undisturbed, it will, as it falls from the place, leave a well-formed delicate cuticle. And I think the nearer we imitate nature in this respect, the more good we will do. We may use starch or mucilage to cover the abrasions, but any astringent or stimulant application is inadmissible. Abrasions, however, do not last long without becoming ulceration, and the treatment may be different. When there are numerous fine chaps covering a large surface of the nipple, or when single, if very shallow, the treatment for abrasions will usually answer every purpose. Ointments of a mild, unirritating, or even a soothing quality, are probably more applicable than in abrasions. The following is a very good one:

℞ Cerat. Alb., ℥ ij.
Ol. Amyg. Dulc., ʒ j.
Mel. Desp., ℥ ss.

Mix. Dissolve with gentle heat, and add Bals. Canad., ʒ iiss. This should be applied every time after nursing. When the cracks are deep, it is indispensable to quick cure that they should be closed up, and kept so until complete adhesion of their sides takes place. This may usually be done with great facility in the following manner, viz.:—Press the nipple in such a way as to close the crack, and while thus holding it, apply a thick layer of collodion over the surface. We should apply the layer thickly, and have it extend some distance in every direction, so that it will keep the crack together. The collodion is not easily sucked off by the child, and if the nipple shield be used, it need not be disturbed at all until completely healed. We should watch the coat of collodion, and remove it when it seems to be becoming deficient by violence of nursing. In most cases this covering, if kept up inviolable for a week, will suffice to complete a cure if suppuration is not going on in the chapped place. If this is the case, and the surface becomes an ulcerated one, it will fill up by granulation alone, and falls into the category of ulcerations. In this part of the body ulceration does not differ from the conditions it assumes in other places, and it cannot be expected that I should dwell upon every variety that may occur. General principles must guide us here as elsewhere. There are two conditions, however, one of which is apt to obtain a prominence and give character to this ulcer, acute and chronic; in either of these conditions the ulcer may be exceedingly irritable to touch, and painful, and in the latter, indolent and atonic. The acute variety is apt to be attended with considerable heat, tumefaction, color, and tenderness. These conditions should be removed by depletion, as by leeches,—one or two will generally do,—cold emollient poultices, large enough for the nipple alone, and removed as often as they become warm. Or we may envelop the nipple in a thin layer of thick mucilage, covered by oil silk, so as neatly to fit the organ, kept cold by ice applied in a minute bladder or india-rubber-bag, or we may wrap the ice in oil silk. In whatever envelope it is used, it should not extend beyond the inflamed part, and should be separated from it by a thin layer of cotton wool, or something of that kind.

When such remedies are not necessary because of the non-existence of these symptoms, we should content ourselves in the very early stages of ulceration with similar mucilaginous and bland ointment applications as in abrasions, but as the process goes on, and the acute symptoms entirely subside, astringents become useful, and these will vary in character and strength, according to indications of atony and flabbiness, etc. Alum and tannin are excellent applications at first, but will have very little effect after it has continued for any great length of time. Sulphate of zinc and borax will come next in respect to time. One scruple of tannin to one ounce of rose-water, five grains of alum, the same quantity of sulph. zinc, are all good in the earliest stages of ulceration of the nipples, when the more acute symptoms have subsided. The following formulæ are often very useful:—

℞ Glycerine,	ʒ ij.
Soda Subboras,	ʒ ss.
Aquæ Rosæ,	℥ iss.

Mix. Use as a wash each time after sucking. Or,

℞ Soda Subboras,	ʒ ij.
Cretæ prep.,	℥ j.
Spts. Vini,	
Aquæ Rosæ, āā,	℥ iij.

Mix and dissolve. This last may be used when the ulcer is becoming somewhat indolent. Tinct. kino, tinct. nutgalls, and, in fact, almost every astringent has been used in these ulcers. In chronic ulcers still stronger astringents or stimulants will become necessary in conjunction with other remedies. A skilful use of the sulph. cupri and nit. argent. will do a great deal to heal up and shorten the course of these chronic ulcers. The nitrate has done the most good in my hands. It should be applied in substance to the surface of the ulcer, and never be used oftener than once in eight days, when a second application becomes necessary. Between times the ulcer may be dressed with some of the milder astringents, alum or tannin, for instance, in solution. In the irritable variety, some narcotic extract should be made into ointment: Belladonna, hyoscyamus, opium, etc. An excellent expedient, and one that will often entirely change the character of these ulcers, is to anæsthetize the part with ice, as is directed to be done on a part before the performance of an operation.

We are very apt, after we begin to use curative measures, to neglect the palliative. This is a great mistake, for they can have but little good influence while the causes are allowed to act with all the power that is necessary to produce the disease. We cannot attach too much importance to the measures of palliation.

The treatment of milk abscess is one of great importance, because of its frequent occurrence and destructive effects. The remedies naturally range themselves into preventive and curative. The preventive has reference to the management of the anatomical and pathological conditions of the nipple which prevent the free elimination of the milk. Of the latter I have written quite as extensively as the limits of this paper will allow. Can we change the anatomical deficiencies or depraved shape of the nipple, of congenital or acquired origin? It is a matter of the utmost importance to the health and happiness of the patient that this question should be decided promptly and properly. Much will depend upon whether our attention was drawn to the case early in pregnancy, or not until the time of labor, or even afterwards, as to the probability of success in many cases. In other cases we can decide the nipple to be impracticable from the first sight, at whatever time we examine it, and I would insist upon the impropriety of compelling a woman to pass through the terrible pain and exhaustion which attend these cases where the nipple, for instance, is entirely wanting, and prehension impossible. If our attention be not drawn to the nipple until after labor, and the functions of the breast are required, we ought not to hesitate to decide against nursing or attempting it. And so far as I am concerned individually, I would advise against the endeavors to use the breast at all, if I were aware of its conditions at the beginning of pregnancy. Fortunately this deficiency is rare. When there is an approximation to this, but not complete absence or depression of nipple, much may be done toward rendering them useful, provided our efforts are judicious and sufficiently prolonged. They should be commenced as soon as pregnancy is known to have taken place; and if in the state of society it were practicable, the prospect of success would be much better could we have the management of our patients as soon as menstruation began. If mothers were well instructed in such matters, and would carefully attend to it, the probability is, that almost no cases of anatomical unfitness for nursing would present themselves.

Flat and deficient nipples, if not observed by the practitioner until after parturition, will be almost certain to give us trouble; we will be scarcely able to prevent extensive milk abscesses. The first and most important principle is to take perpendicular pressure entirely off the top of the nipple, and this would probably be sufficient to prevent the difficulty, if complete. This little projection, on account of the fashions of female dress, is kept constantly pressed back into the soft, yielding mammary tissues, until it becomes hopelessly imbedded into them. Now what we want is to counteract and remedy the effect of this mischievous habit. Quite a number of devices have been resorted to for the purpose of starting the nipple forward from its imbedded condition. They have for their object, as a general thing, the production of counter-pressure around the nipples, upon the areola, and central portion of the breast, in such manner as to press the central tissues beneath the nipple, and thus cause it to protrude. If this object can be effected by such gentle means, continued for a sufficient length of time before the birth of the child, as to make it a permanent state of this organ, the treatment will be effected. The misfortune is, we can seldom get the important desideratum (time), and we are under the necessity of beginning our treatment often too late to effect anything. When called upon to remodel a nipple before or during pregnancy, we may make use of a shield of stiff silver or iron wire, large enough to embrace, and actually pit the anterior surface of the breast, with a cap-like projection from its centre, into which the nipple may project. There may be some soft substance, very thin cotton or wool, to protect the surface from the wire placed immediately beneath it. This should be worn for months under the dress, and receive all the pressure from it, and distribute it over the front of the mamma, and protect the nipple from any pressure. Such a shield is far better than ivory, wood, india-rubber, or any other impermeable substance, as it does not interfere with the transpiratory functions of the skin or the secretion of the areolar follicles and glandulæ.

When we are not called upon to treat these rudimentary nipples until the time of, or after parturition, such treatment will not avail.

The effect must be brought about more promptly, on account of the necessity for immediate use. In many cases the nipple can be made available by temporarily inducing its erection by simple titillation with the finger, moving it gently around it, and then immediately applying the child. An excellent way of erecting the nipple, when there is considerable depression, is to place a thick layer of collodion around it on the areola. When this dries and contracts, the nipple will be elevated quite prominently. The child should then be placed to the breast and allowed to nurse.

When the nipple is protruded in some of these ways the milk may usually be drawn, so as to, more or less, completely empty the reservoirs. This will prevent milk abscess very generally. When inflammation of the reservoirs has fairly begun, it will be exceedingly difficult to prevent suppuration. The curative means consist in thoroughly evacuating and keeping empty this set of vessels. Several modes of doing this have been recommended—such as drawing with a glass tube shaped like a pipe. Various shapes of breast tubes and pumps are in use, but I must object to *all* of *these*. It is a very easy matter to injure the delicate tissues of the breasts by the hard rim of these instruments, and I think the accident often happens.

A puppy is often brought into requisition for this purpose, but is rough, and sometimes irritates the nipple, and even sucks the skin off it. The only proper thing for drawing the milk is the mouth, and when these reservoirs are inflamed, it should be the mouth of an adult, who can vary the pressure or force to suit the tenderness of the part. Another very useful class of measures are those intended to suppress the secretion of the milk, and thus relieve the reservoirs from the distention. The narcotic substances taken internally or applied externally to the breast do a great deal towards stopping the secretion of the milk. Opium in large doses, so as to keep the patient very thoroughly under its influence, aids very much in arresting the secretion of milk. Applied externally in ointments, so as to produce a decided impression upon the system, it has a similar effect; but belladonna seems to have acquired most renown for this purpose. Mr. Richard Marley reported forty cases to the Obstetrical Society of London, treated successfully by inunction of belladonna. Dr. Tanner corroborates Mr. Marley's conclusions by his own experience. American physicians testify in favor of belladonna, by furnishing to medical periodicals a great many favorable cases within the last two or three years. It should be remembered that many of the extracts sold in the shops, if not entirely inert, are at least much below the standard in strength. Our opinion of the efficacy of these, of course, will vary from this circumstance, and hence, doubtless, the discrepancy in the testimony of different observers in regard to the use of belladonna for the purpose of suppressing the secretion of milk. The inunction of ointment made with the extract should be carried to a sufficient extent to produce some of its characteristic effects upon the system. Its use should be as profuse as the system will well bear. Cold, as a local application in cases of milk abscess, has several good effects. It anæsthetizes the part, rendering the patient more comfortable; it decreases the secretion, constringes the reservoirs of milk, and allays excitement in the capillary circulation. In applying cold to the breast, the temperature should be about forty or forty-five degrees, and kept as steadily at that as possible. Water of that temperature might be kept running through an india-rubber bag enveloping the organ. A bladder partly filled with ice and water, with a piece of flannel between it and the skin, would also do very well. When we do not desire to promote secretion of milk, cold may be used. I do not believe there is any danger from it while its application is confined to the part affected, and its bad effects are usually produced by wetting the clothing, or allowing it to get applied to other parts of the person. I cannot express with sufficient force the evil effects which the prejudices of a former age in medicine have fastened upon the minds of at least a part of the public, in the practice of keeping the breasts wrapped in thick layers of cotton or lamb's wool. It is promotive of the secretion of milk by drawing blood to the gland, and thus keeps up the state of things we desire to avoid. For internal treatment, a saline cathartic every other day, and two grains of iodide of potassium every four hours, may be relied upon as materially aiding the other treatment. In this affection antiphlogistic treatment is merely auxiliary, and should not be pushed to an extent usually considered necessary in other inflammatory affections. In this case over-distention is the cause of the inflammation, and its removal in the early stages is generally sufficient to cure.

Acute inflammation of the glands of the breast, when it occurs as the effect of congestion immediately preceding the secretion of milk, is apt to be very extensive, sometimes involving the whole of the gland, and will require energetic treatment. For the first few hours we should try warm fomentations, with the hope of establishing the secretion. This probably would be unavailing if actual inflammation had begun; but we cannot always determine the point when this intense congestion passes into inflammation, and hence we are justified, I think, in making the effort. If the patient is robust, and the fomentations fail wholly or partially to bring relief, a decided venesection will often turn the balance in favor of resolution. When we bleed, the object should be to produce a decided impression; and in order to do this, the patient should be in a sitting posture, and the blood allowed to run until the pulse is affected and syncope approaches. I have so much faith in verat. viride in combating inflammation, that I should begin its use immediately after v. s., and if the patient is strong, give it in six-drop doses every four hours until the pulse is brought down to sixty in the minute, and then, by administering it in decreased doses, keep it as nearly at that as possible. One grain of calomel with a quarter of a grain of sulph. morph. may be given occasionally, if the pain is urgent, every four or six hours. This kind of promptitude and energy of treatment will frequently arrest the inflammation and bring about resolution. And when we remember the amount of suffering and damage it may prevent, nothing should deter us at least from urging our patient to accept the treatment. Should this not be sufficient, it is an important question whether depletion can be carried further. One good full general bleeding, if followed by veratrum, will be sufficient generally; but sometimes it will be expedient to use leeches, and produce a general alterative mercurial influence. A lotion made of one part of sulph. ether to two parts of alcohol, will be a good soothing adjunct after the inflammation becomes permanent. If the inflammation begins later the extent of disease is apt to be less, and may be confined to one lobule, or, at most, a part of the gland only. In this case a brisk cathartic of calomel, aided by some saline, leeches to the part, followed by cold lotions, tinct. verat. viride, or solution of tart. ant., given at sufficient intervals, in proper quantities, will afford us efficient treatment. If this treatment is begun early we may expect much good from it. It has always been an interesting question with me, after the inflammation has existed for a length of time, and we cannot avoid the formation of pus, whether we should abandon antiphlogistic means and resort to warm poultices and fomentations to promote suppuration. I think that this is not justifiable in many instances. The probability is, that if we continue our general and local antiphlogistic treatment until suppuration is clearly evident, we may limit the extent of that termination, lead to resolution in a larger part of the gland than would otherwise take place, and thus save much of the glandular tissue. When the *whole gland* is inflamed there is no necessity, in fact I think it injurious, to institute and continue strenuous efforts to draw the breast. There is little or no secretion, and when a part of the gland only is inflamed, and milk is produced by the rest of it, it is questionable whether anything but the most moderate means for this purpose are admissible. Retained milk is not the cause of inflammation in this case, as in milk abscess. Very frequently glandular inflammation is complicated with inflammation of the reservoirs; then we must combine our treatment to suit the case: local and general antiphlogistics, with means to arrest the secretion and empty the reservoirs of the milk already contained in them. Chronic inflammation of the gland will be cured by much the same treatment successful in other glandular inflammations of this grade; leeches, mercurials, iodine and vegetable alteratives, perseveringly administered internally and locally applied. Much reliance can be placed upon well-regulated and graduated pressure with adhesive straps, pressing the part diseased against the ribs; or collodion encasing the breast thoroughly. When suppuration has taken place, what are the indications to be relied upon to justify us in evacuating it? There can be no doubt, I think, that the earlier the matter is let out the better, for several reasons. The cavity becomes larger by allowing it to remain; it burrows through the surrounding tissues; the longer it remains the greater the amount and duration of the irritative fever that accompanies its retention. But notwithstanding the desirableness of getting rid of the pus, we should hesitate to cut through uncondensed tissue to any extent. In cases where the inflammation and suppuration are deep in the gland, it is desirable to wait until the pressure from within has lasted long enough, and in a sufficient degree to cause the condensation of the tissue. Otherwise it will require a very large opening to allow a free discharge. I think we should not lance the part until fluctuation is quite evident, and the pus has made its way to the fascia or integuments. It is never desirable to cut through any part of the uninjured gland or milk ducts, and altogether I should feel more inclined to allow it to approach the integuments very closely before cutting.

In the case of milk abscess, the earlier the opening is made the better. As soon as it is evident that suppuration is inevitable the opening may be made. The smaller the opening, to allow the escape, the better. Should the disease still exist that caused the retention, the opening should be preserved. Often the evacuation of one or two reservoirs will suffice, and the rest will continue to discharge through the nipple. The effect of suppuration and evacuation of a milk reservoir is often to entirely destroy its cavity; but in other instances it continues to discharge through the artificial opening, and a milk fistula remains. This may be closed by an occasional application of the nitrate of silver in pencil. Worse than these are the tortuous lacunæ that sometimes result from the deep glandular abscess of the breast. They are generally difficult to cure. Injection of iodine is the remedy most relied upon for these troublesome sequences to suppuration. The most effective way to inject is to insert a soft flexible catheter, if possible, to the bottom of the twisted canal, and throw the injection through it, so as to apply it without dilution to the bottom of the pus fistula.

I think this important when practicable, because it favors the shallowing instead of the narrowing of the cavity.

Of course it is never advisable to slit up these obstinate puriferous ducts in the breast, as it sometimes is in other parts of the body, because of the amount of tissue that might be damaged which it is desirable to save.

DIFFICULT LABORS.

These are merely tedious, or they may be instrumental, or complex. If tedious, they terminate spontaneously and require really no more attention than natural labors, and differ from these only in requiring more time to accomplish. As the duration of a natural labor is not over twenty-four hours, when it continues beyond this time the case falls into the category of tedious or lingering. The causes or impediments giving rise to difficult labor are generally the same in kind, varying only in degree. They cause the labor to be tedious, or protracted beyond the usual time, when slight in degree, and make it necessary to use instruments if they are sufficient to present an obstacle that nature cannot overcome. To give an instance:—Some ten years since I was called to see a patient in labor, in consultation with Dr. Gore of this city. She had already begun to show signs of exhaustion, and it was thought best to apply the forceps to the head, which was low down in the pelvis, and had not advanced to a perceptible extent within the last four hours. Half an hour was consumed procuring the instrument, and during that a hydrocephalic fœtus was expelled. A short time afterwards I saw another patient, in consultation at a neighboring village, whose labor had been protracted to thirty-six hours. The pains had been very active, and the head had been pressing heavily upon the perinæum, but now they had become inefficient, and the head had receded above the superior strait. As other symptoms of exhaustion were present, and a careful examination induced me to believe that the fœtus was hydrocephalic, and its delivery impossible unless the head was lessened in size, I perforated it, drew off a large quantity of fluid, and then extracted it without any difficulty. These were precisely similar cases in kind, but the degree of enlargement in the first instance was not so great as in the last. The cause of difficult labor may operate to protract labor in both stages, or in one only, and the consequence to the patient will very materially differ in consequence of this fact. If the time is lengthened out during the first stage, the effects will be less serious than if the cause operate to retard and protract it in the second, or in both stages. As the first stage is naturally much longer than the second, its tediousness is of less consequence. In the first stage the number of muscles in action are few comparatively to what they are in the second, the uterus alone is acting, while in the second stage a large number are co-operating with it; hence exhaustion in the first stage will not be likely to take place as the effect of much exertion, and when it is brought about it is the effect of long wakefulness and nervous suffering; in the second stage, however, all the powers of the system are impaired. The first is nervous prostration, and the latter is real exhaustion. In the first stage of labor there is no danger to the mother's organs, or the fœtus, from long-continued pressure, while very disastrous consequences to both mother and child often follow too great protraction of the second stage. There are very few cases, therefore, in which apprehension need be entertained for the ultimate results, where the first stage alone is protracted. The second stage of difficult labor, therefore, is the dangerous period. The circumstances causing difficult labors are very numerous, and quite diverse in character. I shall enumerate and describe the nature and features of such as are recognized by authors, so far as I can appreciate them, and lay down rules for the government of cases where the causes cannot be detected, or where their removal is impossible. A very common cause is inadequate or *inefficient labor-pains.* The uterus fails to exert the power necessary for the expulsion of the fœtus. This condition arises from various causes. The organ is sometimes weak as an accompanying condition of great debility of the system generally, from want of native strength, or as the effect of disease. The ordinary means for the support of the exhausted powers, as stimulants, nutritious diet, and encouragement are our resources in such cases. The mind of a patient in labor has great effect upon the action of the uterus, and sometimes will arrest it entirely. An instance of this kind occurred to me several years since, in the person of a young lady sick in her first labor. The labor had advanced to a full dilatation of the os uteri, and I was expecting that each succeeding pain would rupture the membrane, when her husband was taken with pulmonary hemorrhage and died before he could be taken from the room. She did not have another labor-pain for eighteen hours, and when they came on they were so feeble and inefficient as to require artificial delivery. Discouragement often renders the pains of labor very inefficient. Sometimes the pains are materially enfeebled by the announcement that interference will probably be necessary. The uterus is sometimes distended to so great a degree with liquor amnii or multiple pregnancy as to prevent efficient contraction of the uterine fibre. The enormous size and evident fluctuation in the first condition will enable us to detect it, while auscultation and a careful examination of abdomen, externally, will enable us to diagnosticate the latter. The former condition, when clearly made out, may be remedied by rupturing the membranes; but we should be quite positive in our diagnosis before we resort to this measure, as too early a discharge of the amniotic fluid will also cause inefficient uterine contractions. I think this last is a more common cause of inefficient labor-pains, in breech presentations especially, than is suspected. Many cases of want of proper contractions occur where the cause cannot be traced. Everything, so far as we can judge, is entirely correct and in good condition, but the uterus will not act with sufficient energy to terminate the labor. These are the cases in which means for the stimulation of the uterine fibres and remedies that act directly on the uterus are called for. The cases arising from other causes, when the causes cannot be removed, or when removed the effect still remains, may be subjected to more direct treatment also.

It is not a difficult matter to diagnosticate uterine inefficiency. The pains are short in duration, and have but little effect in forwarding the presentation; the intervals are long between them, although this is not necessarily the case. The contrast between these pains and those that are efficient is generally pretty well marked. Pains that are doing well ought steadily to increase in force, duration, and frequency, so that in comparing one hour of labor with another we can see a decided difference in these qualities; while inefficient the pains do not increase in any of these respects, or if they do at all, very moderately. In the former cases the effects are obvious; there is all the time a decided progress; in the latter there is so little that there is some doubt in our minds whether there is any.

Treatment.—As before directed, we must endeavor to remove the cause; when this is impracticable or inappreciable, we must stimulate the uterus by as direct means as we can command. A little nervous or vascular energy added to the powers of the patient may be sufficient to arouse the uterus quite readily and decidedly, and for this purpose there is a certain kind of mild stimulation by ginger, capsicum, or mint tea, that is always allowable when the system is not depressed sufficiently to require alcohol or other more decided stimulants. A warm cup of ginger tea is often attended with an increase of uterine contraction. A stimulating injection is sometimes attended with a like good result. This may be made by adding a teaspoonful of oil turpentine to half a pint of gruel. A very efficient, and, I think, entirely harmless expedient for increasing the contraction is grasping the uterus through the abdominal walls with the hand and kneading. One hand may be placed on the central part of the abdomen, and, when the pain begins to come on, made to grasp and rub the uterus during the time the pain continues. In this way we will often increase the force and duration of the contractions, and if they are slow to return we may sometimes materially shorten the interval between them by commencing to stimulate the uterus in this way a little before the pain commences. If we observe stated intervals, we may make the interval between pains grow progressively shorter, and thus initiate an appropriate increase. I have seen so much good done by this simple means, and have so much faith in its efficiency, that I habitually resort to it in a great many cases, when more energetic measures are thus superseded. When we fail to accomplish our object by the use of these means we are justified in resorting to the specific uterine stimulants. And although there are others, such as borax, the root of the cotton-plant, etc., yet there is none that I shall think worth while to recommend but the secale cornutum, or spurred rye. A description of this drug and its preparations in the works appropriated to such purposes makes it unnecessary for me to do more than speak of its practical application in difficult labor. It is a most energetic remedy, and if misapplied may do much mischief, so that we should be very careful to consider the circumstances well before administering it. The first and main proposition is, that there should be no obstacle in the way of speedy delivery when this force is applied. The os uteri and other soft parts should be dilatable if not dilated, the pelvis roomy enough not to hinder its passage, the position of the fœtus cephalic, and not abnormal in size or formation. I am aware of the advocacy of Dr. Millat and others of its use in shoulder presentations, where turning is impracticable, the fœtus is dead, and the pains lack energy. Dr. Millat gives it with a view of causing evolution and expulsion of the fœtus; but I think the practice very reprehensible, to say the least of it, and in such cases would much prefer evisceration and turning by means of the crotchet. It is administered by the mouth or rectum—twenty grains of the powder or a small teaspoonful of the fluid extract every half hour, in a little water, syrup, or sugar, will exert all the influence we may hope to derive from it in a very short time. On many occasions where the stomach was very irritable I have had it administered per rectum, with as ready and energetic effects as by the mouth. An infusion of three drachms to half a pint of water is a good form to give it as an injection. One half of this may be thrown into the rectum, and if no effect results in half an hour we may have the balance administered in the same way. Given in either of these ways it operates very quickly. There is usually an increase in the force and frequency of the pains in twenty to thirty minutes, and it will rarely act if its influence is not perceptible in less than forty-five minutes from the time the first dose is given. The symptoms of its influence are generally unmistakable. All the attributes of the pains are intensified,—force, frequency, and duration. The pains in some cases seem almost continuous, and so powerful as to keep the patient in constant effort. It is a mistake, however, to suppose that there are not degrees of ergotism. From a good deal of observation I am convinced that ergot sometimes produces only a moderate effect, increasing the pains to a temperate degree. Ergot is a medicine about the efficacy of which there has been and continues to be much dispute. Some practitioners continue to doubt whether it has any effect upon the uterus, but I think the number of supporters is constantly increasing. It is certainly not unfrequently the case that it entirely fails to produce its specific effects, but I am of the opinion that it is because of the quality of the article. Judging from my own observation, I should think it very soon loses its efficient qualities by keeping, and that if we use it in substance it must be kept very carefully. On account of the great difficulty of keeping the drug, and consequent likelihood of its becoming inert, I for some time have used the fluid extract, and I think with more uniform results. Ergot is very uncertain in cases of immature development of the uterine fibres, hence we are often disappointed in its effects in cases of abortion at an early period. This uncertainty has been urged as an objection, but I think a wider experience and more critical examination of the causes of its failure will do away with this objection. There are objections of a more serious nature, and which seem to have some foundation in truth, urged against its use. It has deleterious effects upon the fœti, many of which under its action are dead born. Dr. West is the most sanguine advocate for the use of ergot of any writer with whom I am acquainted, and thinks very seldom, if ever, are the effects attributed to ergot due to it, but to the circumstances for which it is given. Although my experience is much more limited, I cannot resist the conviction that I have seen a number of cases of still-born fœti, the death of which could fairly be traced to the use of ergot. It acts injuriously upon the fœtus by pressure of the cord around parts of the body, or by too strongly and constantly pressing the head into the pelvis, embarrassing the circulation to a fatal extent. But in some instances where the ergot failed to produce its specific effects upon the uterus, the child is born dead with no reason apparent to account for it, unless upon the hypothesis that it has been poisoned by the ergot. Indeed in a majority of the cases in which ergot was followed by loss of the fœtus, under my own observation, the contractions were not appreciably increased, and the child was not expelled for more than an hour; and I feel more apprehension for its safety if it is not expelled within an hour of the time of administering the ergot, and especially where the uterus is apparently not inflamed. Another evil mentioned as likely to result from the powerful action of ergot affects the mother, viz., the rupture of the uterus or laceration of the vagina or perinæum. I have not seen these last-mentioned bad effects, but can easily understand how urgent ergotism might do much damage where there is a serious obstacle to the passage of the fœtus, or when the soft parts are so rigid that they will not readily yield to the distending influence of the head. Dr. Beatty, in the August number of the *Dublin Quarterly* for 1850, advocated the use of ergot and chloroform. Since that time they have been used together by others, and the ergot seems to act with the same efficiency, or nearly so, as if the chloroform was not given. I have myself used them in this manner several times, and with the most desirable results, and I believe there is less likelihood of laceration of the vagina and perinæum when the chloroform is given than when the ergot is administered alone. The stethoscope is used to watch the effect of ergot on the fœtal heart; and when its depressing effects become apparent on this organ, artificial delivery by the forceps is resorted to, when practicable, to save the life of the child.

Deformity of the Pelvis is a cause of difficult labor also. The deformity takes almost an endless variety of shapes, and a great range in reference to degree of contraction. There may in fact be contraction without any vice in shape, simply a small pelvis, or there may be great distortion without diminution in size; generally, however, contraction and distortion of shape go together.

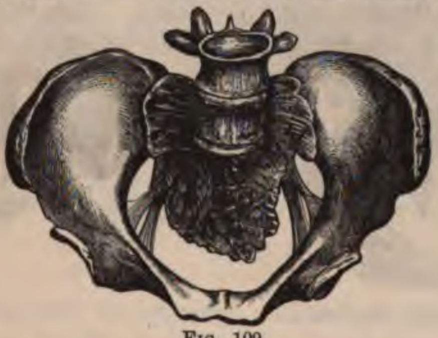


FIG. 109.

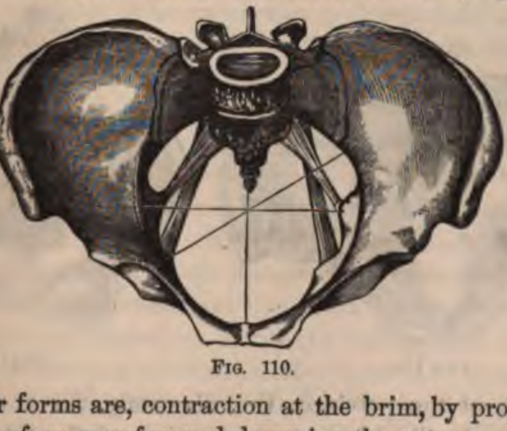


FIG. 110.

The simpler forms are, contraction at the brim, by projection of promontory of sacrum forward, lessening the antero-posterior diameter; contraction of the antero-posterior diameter of the cavity of the pelvis, by the sacrum being too straight or deficient in curvature, the shortening of the oblique diameter of the cavity by too great a curve forward and inward of the spinous processes of the ischium; contraction of the transverse diameters of the outlet, by too great approximation of the tuberosities of the ischiatic bones; or lastly, the shortening of the antero-posterior diameter of the inferior strait, by too great a curvature of the lower end of the sacrum forward, the ossification of the coccyx, and anchylosis of this bone to the sacrum. One of these causes of deformity may exist separately, or two or more conjointly. I think it is not uncommon to notice the incurvation of the sacrum and the approximation of the tuberosities of the ischia, thus contracting the outlet of the pelvis in two diameters, the antero-posterior and bilateral. With the approximation of the tuberosities we

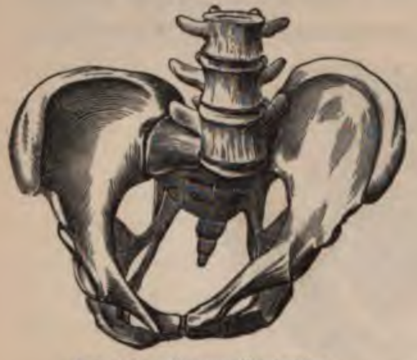


FIG. 111.—Oblique Distortion.

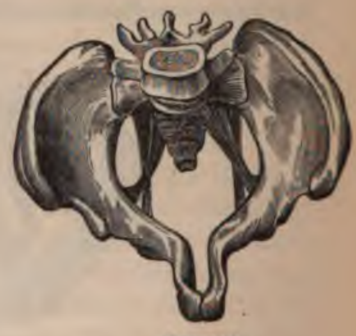


FIG. 112.

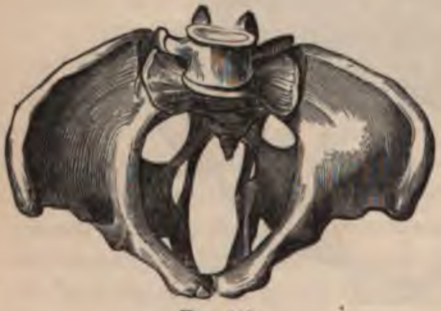


FIG. 113.

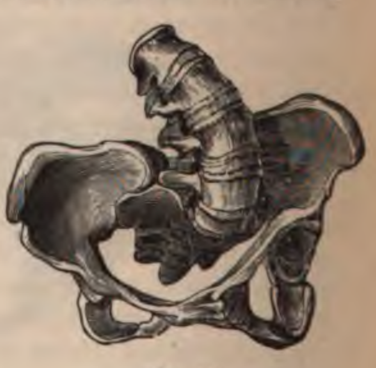


FIG. 114.

sometimes have also the encroachment of the spines and straitness of the sacrum. The complicated varieties of distortion of the pelvis are, first, the oval, represented by Fig. 109; the angular, by Fig. 114; oblique, Fig. 111; rostrated, Fig. 112. Other varieties of shape might be pointed out, but they are combinations of these. In these varieties of shape it will be noticed that in some of them some of the diameters are increased while others are decreased, and in other instances all the diameters are shortened.

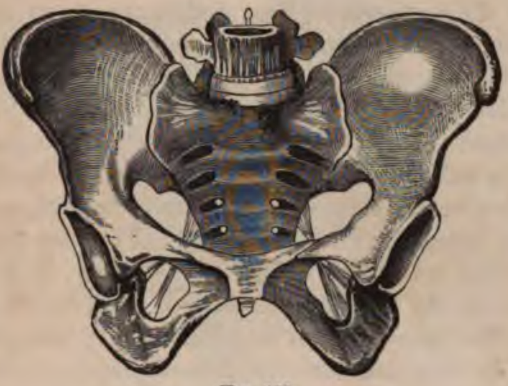


FIG. 115.

Another thing will be apparent, and that is, that the upper and lower straits and the cavity of the pelvis are all affected by the distortion. The degrees of contraction are estimated according to four important circumstances in connection with the labor. The first of these is as to whether a living child may be delivered by the power of nature; and it is believed that with three inches and a half in the antero-posterior diameter, and four and a half bilaterally, this may be the case. The second is as to the possibility of delivering a *living child* through it with the use of the forceps or by turning; and three inches antero-posterior and four bilateral are the dimensions given as large enough for this purpose. The third relates to the practicability of delivering a child through the pelvis by means of destructive instruments. The minimum size given is one and a half inch antero-posterior diameter, and three inches from side to side. And the fourth to contraction below these last dimensions, making delivery *per viâ naturalis* entirely impracticable. These dimensions are given as a measure of the skill of the gentlemen who are specially skilful in the use of instruments, and I think it would be safe to add somewhat to the room, in order to accommodate the less habituated operator.

The difficulty of operating for the delivery of the fœtus through a contracted pelvis will be influenced by the part of greatest distortion. If the narrowest point is at the brim, the presenting portion of the fœtus will be so remote as to very materially embarrass our operation. If the brim is large enough to admit the head, but the narrowness stops it high up in the cavity, the difficulty will be less; and if the obstruction is at the outlet alone, we may operate with much greater facility and certainty. The distortions of the pelvis result from disease of the bone in infancy for the most part, but also in adult life. Rachitis the disease is called during infancy, and malacosteon in the adult. It consists essentially in the soft condition of the bones. There is less earthy matter in them than natural, and in consequence the bones are soft and flexible. They are thus in a condition to bend under the weight of the body. In a standing or sitting position the weight of the body is supported by the pelvis, and when the bones are soft and flexible they may consequently bend and be moulded into the vicious shapes above described. After being thus affected, and while kept bent by continuation of the position causing them, the bones are restored to their natural hardness by a deposition of an appropriate quantity of lime in their texture. The irregularities of shape are caused by the difference in the hardness of different parts of the bones; if they are softer at the pubis, this will give way and project forward, as in the rostrated variety, especially if there is much softness at the sacro-iliac junctions, etc. The instruments for, and the modes of measurement of the pelvis have already been described, and need not be repeated here.

Bony tumors seem to obstruct the passage of the head through the pelvis by lessening its diameters. They are exostoses from the inner surface of any of the bones, or portions of them. They more frequently grow from the surface of the sacrum, probably, than any other part. Sometimes there is but one, but again we find them in other instances to be numerous. In size they also differ quite as much, merely giving inconvenience by a very slight encroachment upon the cavity, or again almost filling up the pelvic canal. I was called to see an instance, in 1847, where the tumor sprang from the plane of the ischium. It filled up the pelvis so nearly that there was but a semilunar space of an inch and a quarter in measurement from the right side of the linea ilio-pectinea and the surface of the projection. This semilunar space extended around from the sacrum, including it, to the pubis in front. The head, of course, was arrested at the superior strait, and the fœtus was removed by the abdominal section. Tumors of the soft parts within the pelvis are much more common than the hard ones. These have their origin in the ovaria, and may be hard, as scirrhus, or fibrous, or dropsical. The former are not so frequent as the latter, and when large are very much more difficult of management. When the descent of the head is obstructed by hard ovarian or bony tumors of the pelvis, the treatment will be precisely such as is applicable to contracted pelvis. If the tumor can be elevated above the brim, so as to allow the head to advance before the tumor, there will be no further difficulty; but if this is impracticable, and the space is not diminished so but that the delivery may be effected by the forceps, this instrument should be employed. Too small for this, craniotomy is the next resort, and if the space will not permit this to be done, the question arises as to the propriety of attempting to remove the tumor, or a part of it, and deliver per vaginam or remove through a section of the abdominal walls. Very much must be left to the judgment of the accoucheur to decide, considering all the circumstances of the case; but I think

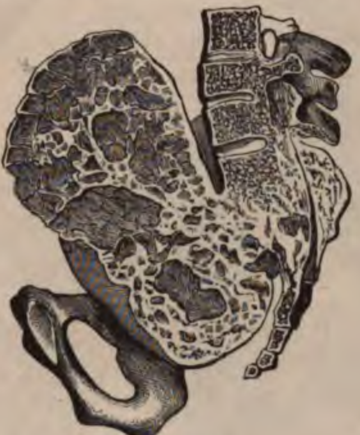


FIG. 116.

when a tumor has its origin above the pelvis, or is bony in structure, the abdominal section is by far the best, because the least dangerous operation. The dropsical ovary may be managed with less difficulty. There is no great difficulty generally in diagnosing the kind of tumor, and, so far as treatment is concerned, but one item in the diagnosis is necessary, and that is to determine that the contents are fluid. This may be done by the sense of fluctuation detected in it, and it may be distinguished from distention of the bladder or the rectum by fluid contents, by passing the catheter into the bladder and removing the contents of the rectum. After this has been accomplished, if there is doubt, we may introduce—and I think we ought always to do this—an exploring trocar. This will demonstrate the nature of the contents of the tumor. The ovarian fluid is peculiar in being thick and albuminoid, sometimes light-colored, sometimes dark

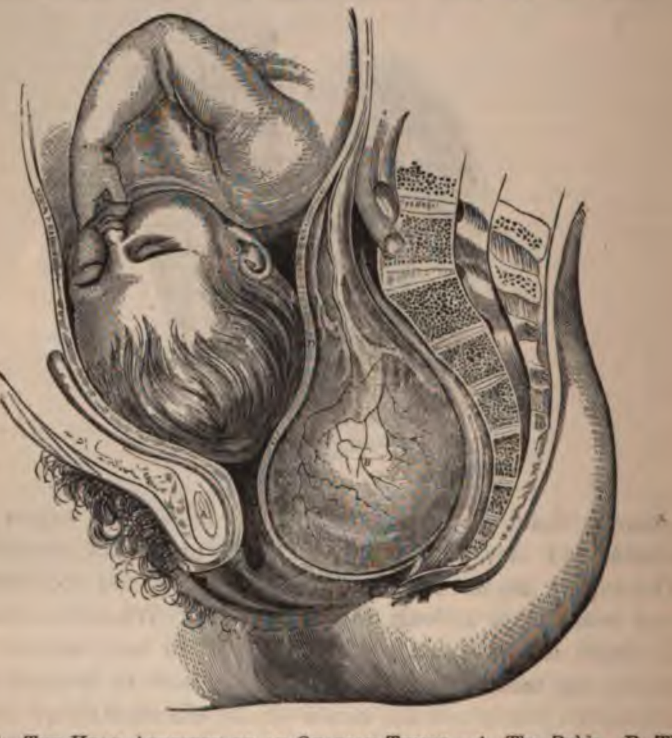


FIG. 117.—THE HEAD ARRESTED BY AN OVARIAN TUMOR.—A. The Pubis. B. The Tumor. C. The Rectum. D. The Posterior Wall of the Uterus.

and grumous, but generally thick and tenacious. A large trocar will soon evacuate the fluid and cause the tumor to collapse and disappear, when the fœtus will be expelled, or may be delivered by appropriate instruments—the forceps when possible. An instance of this kind came under my notice seven years since, by being called in consultation with the late Dr. Slattery, of this place, where the tumor was so large, and had descended before the head of the child in such manner that the presenting part was reached with great difficulty. The evacuation by the trocar permitted the head to descend and pass the soft parts in a very short time. It may be of interest to the reader to know that the opening thus made was never closed, but continued as a sort of fistula for several months, when acute inflammation attacked the tumor, suppuration resulted, and the consequent changes destroyed the growth, and the patient is now entirely well. Solid tumors, either bony or otherwise in composition, when extra-vaginal, should not be operated on during labor. The lymphatic glands sometimes grow so large from scrofulous deposit as to obstruct the passage of the head. Generally, if not always, these cases may be terminated by the forceps. Tumors in the vaginal walls are not unfrequently the cause of much difficulty during labor. A case of this kind occurred in the practice of Dr. John Bell, of Benton Harbor, Michigan, in 1868. It was a fibroid tumor, situated in the septum between the bladder and vagina, extending from the symphysis pubis to the uterus, and encroaching very decidedly on the dimensions of the pelvic cavity. When removed at the Mercy Hospital, in this city, about six months after, it weighed eight ounces avoirdupois. The texture was quite firm. The labor was protracted for seven hours, Dr. Bell thought, but was terminated spontaneously by the tumor being pressed out of the vulva sufficiently to allow the head to pass. As the head passed, Dr. B. says, the tumor was entirely outside the pelvis, resting on the anterior surface of the pubes. This tumor was found to be an encysted fibroid, and removed by splitting up the cyst and enucleating it about six months after the labor. Polypous growths from the cervix uteri, and even from some distance up inside its cavity, are occasionally serious obstacles to delivery. This is the case only when quite large, as a small polypus would be flattened by the great pressure, and prove of little importance. When large they should be permitted to pass down before the head and remain outside the vulva until the head escapes, when they may be returned, as should the tumors in the wall of the vagina, until recovery from the puerperal condition is complete, and then be subjected to surgical treatment. Should delivery be impracticable by the efforts of the uterus alone, the forceps may be employed, when they can be applied, to supply the necessary additional force. If this cannot be done, then the question between removing the tumor and resorting to craniotomy is to be decided. I should unhesitatingly ligate the neck of the tumor and remove it with an écraseur, being sure to remove the ligature after the lapse of eighteen or twenty hours, and treat the stump with carbolic acid dressings. Descent of the bladder is occasionally an annoying circumstance in connection with the delivery of the head. It is pressed down behind the pubis and forms a large fold, carrying before it the vaginal walls, making, in fact, a prolapse of the bladder and vagina both. The diagnosis is generally easy, but if any doubt exists the catheter will settle the matter, by passing into the tumor and removing its contents. The introduction of the catheter, by removing the contents of the tumor, does away with the obstacle, and the labor proceeds generally without assistance. But this is not always the case, and it is necessary to raise the extension up and keep it in place until the head passes. And sometimes the forceps will be required after the bladder is evacuated, because the viscera cannot be elevated above the head, and the distress caused by pressure upon it mars the efficiency of the pains to such a degree as to render them entirely inefficient.

Impaction of the rectum with hardened and resisting fæces is enumerated by writers as the cause of difficult labor. I have not seen any serious difficulty arising from this cause. It may be diagnosticated by introducing the finger into the rectum, and the lodgment may be removed by breaking it up with the finger and washing out with warm water through a syringe. A spoon handle is a favorite instrument, judging from the frequency with which it is mentioned in this connection, but no more efficient and much more harsh than the finger.

Rigidity of the os uteri is hardly a proper term to employ in connection with an unyielding state of this part under all circumstances, and can be understood only in a general sense. The conditions of the unyielding os uteri are quite diverse, and require very different kinds of management. There is spasmodic or irritable rigidity, in which the cervix, instead of dilating at the time the ovum is pressed upon it, contracts very decidedly, and although overcome very slowly it is by mere force, not giving way spontaneously at all. When the finger is introduced, and an attempt made to open it by traction, it is resisted, and the parts contract in a perceptible manner. It seems irritated by contact. And yet there is no heat, and not much, and in many instances no, tenderness. It is found in patients of very nervous temperament, or those in mental distress and anxiety. Chloroform or ether, given at the time pain commences, and pushed far enough to remove all irritation, will usually promote dilatation very satisfactorily. The pains of the first stage in this condition of the os uteri are very distressing and difficult to bear. In this form of rigidity morphia in small doses has a very pleasant influence, and belladonna locally applied does not dilate it till it dilates the pupil, but by removing the spasmodic irritability of the parts procures its dilatation quite readily. Very different from this is the muscular rigidity, when the firmness is such as to entitle it to the term rigid. The os remains hard, is not easily impressible by the finger, and under pressure of the pains it remains unyielding. It is generally cool and moist, and not sensitive. It is simply hard and unyielding. This condition is found in aged primipara, large-framed muscular women, and persons who have almost nothing of "nervousness" about them. Time is an important element in the treatment of such cases. If we wait it will be overcome by the pressure of the uterine contractions generally, and as it is to be overcome by force alone, we are justified in gently aiding the uterus with the fingers. The fingers may be introduced, and the anterior lip of the os pressed up toward the symphysis pubis, and retained in that position while action of the uterus affects the posterior part of the cervix. I think this is better than the use of compressed sponge or Dr. Barnes' dilators. These last, however, are an excellent and mild remedy. Tobacco infusion, tartar emetic, and bleeding, are recommended by some authors, but will hardly ever become necessary if the fingers are used as directed. In extreme cases of this kind of rigidity, when the patient is worn out by long watching and intense suffering, there may be a couple of small incisions made into the sides of the os. They should be made by a blunt-pointed bistoury, and be about a quarter of an inch deep; they will be continued by rupture to a depth sufficient to permit the passage of the child's head. The incisions should always be made at the side, for fear the rupture that follows may extend into the bladder or peritoneal cavity. Rigidity of the os uteri is also sometimes attended with a highly congestive or inflamed condition, in which it is sensitive, dry, and tumid, and the uterine contraction attended with a great deal of suffering. There is generally, if not fever, a near approach to it. The pulse is more or less accelerated, with tendency to chilliness. The diagnosis is not difficult, as the tenderness, dryness, and tumefaction are sufficiently distinctive. This is the class of cases, especially if it occurs in plethoric patients, that is benefited by bleeding. A good venesection—a very common practice in obstetrical cases twenty years ago—is often followed by dilatation, increased secretion, and coolness of the parts. But it is not often necessary or best to bleed, as the relief is likely to be prompt after the use of less potent remedies. Tartarized antimony, given in doses of one-twelfth of a grain every half hour until nausea ensues, is generally followed by much improvement, and the pains become more efficient and expulsive in their nature. Should the bowels be costive in the beginning of such cases, a good saline cathartic will aid very much in procuring dilatation. If we do not see the patient early an injection should be used. A warm bath and warm vaginal injections are also appropriate, and in many cases give great relief and encourage dilatation very decidedly. The extract of belladonna ointment, introduced up to the os uteri after the nauseants and cathartics have been used, is also a means of efficient relief.

The worst kind of rigidity of the os uteri is that caused by structural disease. Carcinomatous is the most common sort of lesion of this kind we meet with, and most frequent. It sometimes converts the circle of the lower part of the cervix into cancerous tissue, perfectly unyielding, when dilatation is of course entirely impossible, and the efforts of the uterus tear off the diseased part and dilate the tissues above, so that the fœtus may pass, or the pain ruptures it in one or more places up to the healthy substance. It becomes an interesting question to determine beforehand, if possible, the nature and extent of the deposit, and the propriety of interfering early in the case. The thick cartilaginous tumor formed by the cervix projecting below the head into the vagina can hardly be mistaken for anything else. It is entirely unlike cicatricial tissue in being very much more extensive and harder. It is, in fact, a hard unyielding tumor formed of the cervix by the deposition of cancerous tissue within its substance. I saw a very interesting case of the kind with Dr. Murray, of London, the accomplished Secretary of the London Obstetrical Society. It was in his hospital practice. The patient was about four months pregnant, and her condition gave rise to a discussion of the propriety of inducing abortion to prevent the disastrous consequences of labor at full term.

When the change has been wrought in only a part of the cervical circle the consequences are less disastrous ordinarily, as half of it will dilate enough to allow the head to escape. The practice in carcinoma of the cervix at labor is to incise the diseased part, in order that it may be dilated afterwards. The best place is on the side, one incision on either side, and the operation may be done with the scissors or knife. The incision ought to extend the full depth of the diseased part, but not into the sound portion of the organ. The os uteri is occasionally more or less completely occluded by cicatrices resulting from the healing of deep ulceration. This kind of rigidity is caused by unyielding bands, and it never is deep and hard as in carcinoma. It does not feel like a tumor. This, I think, is a very rare condition of the os uteri as compared to carcinoma of the cervix. If there is so much of the cervical circle thus affected that the child cannot pass, the bands should be divided at the sides if it is equally prominent, if not, the incision should be at the most prominent point.

The vagina and perinæum are sometimes so rigid as to resist the passage of the head for a long time, and by a careful consideration of the conditions in which we find them, we will discover the irritable, muscular, and inflammatory varieties of the rigidity spoken of as existing in the os and cervix, and the treatment should be about the same. The cicatricial obstruction of the vagina and vulva is very much more common than in the os uteri. The obstruction may consist in thin bands of tissue encroaching more or less on the vaginal cavity, or broad and extensive adhesions of the vaginal walls, making an obstacle the depth of an inch or more, more or less perfectly occluding the canal. An examination with the finger will be all that is necessary to discover such adhesions or membranous bands. If this kind of investigation is not sufficient we can use the uterine sound or probe more thoroughly to explore the depth and size of the obstructed vagina. The rule of practice to be followed in all the varieties of this kind of occlusion is to wait until the presenting part is urged strongly against the adventitious tissue, and then divide—the incisions ought to be lateral—it in such way as to make most room for the passage of the child. This course is pursued because, in some partial cases of occlusion, the healthy vaginal wall will dilate enough to permit the fœtus to pass, and also because, if this is not the case, the parts will be distended above, so that we can see and understand the place and amount of division necessary. The cicatrix may be divided by the knife or with the scissors, owing to its position and shape. My attention was called to a case of vaginal constriction, in which the patient was about two months pregnant, by my colleague, Dr. Davis. This was eight years since. Upon examining the vagina a cicatricial constriction occupied all the posterior part of the vagina at its upper portion. I think it must have been about half an inch below the os uteri. The constriction was so great that the os uteri could not be reached except by means of a probe through an opening the size of a crow's quill at the anterior part of the vagina. My advice was to do nothing, but wait for labor to accomplish as much as possible, and then a very simple operation, consisting of a slight incision, would accomplish the remainder. When she was taken in labor I attended her, and did not arrive until the liquor amnii had been evacuated. The finger would not pass the constriction, but by means of the end applied to it I could feel the head pressing strongly on the cicatrix. The sound tissue slowly, but steadily, dilated like another os uteri until, in about three hours, the head passed the constriction and the fœtus was very soon expelled. That the cicatrix was not ruptured was rendered evident by an examination six months afterward. At this time the vaginal constriction was just as I had originally found it. Another interesting case of occlusion occurred in the practice of Dr. Thomas A. Clarke of this city. It was an Irish woman and a primipara. She was a servant in a hotel, and, in washing some windows, fell astride the back of a chair, which wounded the vulva very severely, making it bleed, and being followed by inflammation, that caused her to remain in bed with the great pain and tumefaction for a number of days. She had no attention except such as her old and ignorant mother could give her. She finally recovered enough to return to her duties. At the commencement of labor a midwife was called, but as she could not get a very clear idea of the condition of the patient, Dr. Clarke was sent for, and finding extensive alteration of the parts, asked me to meet him. When I first examined the patient I found a large tumor between the thighs, which, when thoroughly investigated, proved to be the head of the fœtus projecting almost completely beyond the tuberosities of the ischium, covered with the distended vulva, entirely closed except a small opening at the arch of the symphysis, just large enough to admit a female catheter. The hairy scalp of the fœtus could be seen through this minute opening, which had doubtless been kept patent by the passage of urine at this point during the time the adhesion was taking place. The liquor amnii had escaped. A blunt-pointed bistoury was passed down through this small hole between the head and the perinæum, turned, and the parts were divided through about two-thirds the distance toward the anus. At this point one incision on each side was made, extending obliquely backward and outward about an inch. The head immediately passed out, and the labor was terminated in a few minutes. The patient recovered without a bad symptom, and with but an ordinary vulvar orifice.

Obliquities of the Uterus.—The uterus generally varies somewhat from its natural axis, leaning too much to right or left, or projecting forward too far. These deviations, when slight, are not the cause of any inconvenience, but when they are considerable may prove a very serious difficulty. The most common deviation is to the right, a larger part of the body of it lying to the right of the linea alba than to the left, while the os is directed to the left side of the pelvis, and instead of being central, the usual and natural position, may be, in extreme cases, within an inch of the left ischiatic plane. In this oblique position of the uterus the axis of its cavity will extend from the junction of the right hypochondriac and the epigastric region down to the left tuberosity of the ischium. If labor commences under this state of things, the force exerted by the uterus will be largely expended upon the bones of the left side of the pelvis, instead of into the centre of the pelvic cavity. The head is thus arrested, or its progress is very tardy, and attended with much more suffering and pain than ordinary. If, as is sometimes the case, the obliquity is to the left, the same difficulty arises, the axis of the uterus being in the opposite direction. The former position is called the right obliquity, and the latter the left obliquity of the uterus. But there is another obliquity denominated the anterior. In this the fundus projects much farther forward than natural, and the os lies against the upper part of the sacrum. The contractions of the uterus, while the organ is in this position, urge the head against the bony promontory, and if not arrested the labor is protracted. Obliquities are not often met with in primipara, and are more commonly observed in women who have borne many children. The most efficient cause of obliquity is great laxness of the abdominal muscles, so that when the uterus rises up from the pelvis, and is directed forward by the projection of the promontory, and comes against the anterior wall of the abdomen, it yields to the pressure and the belly becomes pendulous, or, if directed to one side by the unusual condition of the viscera, the walls of the abdomen on that side are pressed before it. I think the distended rectum on the left side of the sacral promontory may have something to do in directing the fundus to the right. The extent of these deviations is widely different. The lateral is more limited than the anterior, and in very few instances renders labor impracticable, but in very many cases very much retards it; but the anterior obliquity may be so great as to make it impossible for the labor to be terminated spontaneously. I saw an instance in which the uterus passed almost entirely through the space between the recti muscles, constituting an immense hernia. At the commencement of labor the os uteri was so high up against the sacrum that it could not be reached with the finger.

Other cases are on record in which the obliquity was greater than this. For treatment in the slight degrees of obliquity, it will only be necessary to observe position. If the right obliquity, the patient should lie on the left side,—and it was doubtless the frequency of this deviation that determined the British obstetric position on the left side. If the deviation is to the left, the patient should be placed upon the right side; and the position on the back will correct slight anterior obliquities. But it sometimes happens that this change of position is not sufficient, and we are under the necessity of resorting to some other method of correction. In lateral obliquities we may reduce the deviation and keep the uterus in position by the hands on the outside of the abdomen. There are but few assistants that will be able to do this efficiently, and it will be better to attend to it ourselves. Another method is to place a broad binder on the abdomen, and make it quite tight by pinning. The bandage should be more tightly drawn at the upper part of the abdomen than below. A roller, when properly adjusted, is better than a binder. We should commence the application of the roller at the hips, and proceed upward, tacking or pinning the different rounds together in several places to prevent them from sliding. The bandage generally causes some uneasiness to the patient, and many of them in the frenzy of their suffering will remove them. I was called to see a patient, in consultation, in October, 1865, laboring under anterior obliquity to such a degree as to arrest the child's head at the superior strait. I assisted the attendant, a man of much experience in obstetrical practice, to apply the bandage and correct the obliquity. We believed that the labor would terminate spontaneously. I promised to call in an hour and give any further assistance that might be deemed advisable. In the agony of her suffering she tore the binder off while he was in another room, and the uterus, in its powerful efforts to overcome the obstacle, was ruptured from the fundus to the cervix, and before I returned she was dead from the hemorrhage resulting from rupture of the placental vessels. This was a painful lesson to us of the great danger from this deviation, and the necessity of constant vigilance in the treatment of such cases. When the obliquity is extreme, and cannot be so corrected by supporting the organ with the hand or binder as to restore the axis sufficiently to permit the entrance and passage of the child's head, artificial delivery will become necessary and proper.

Very few instances will require a resort to this extremity, but occasionally we shall meet with them. Of all the causes of difficult labor, I regard extreme obliquity of the uterus as one of the most dangerous, if left to the powers of nature. It is scarcely less so than contracted pelvis. The danger arises from the perfectly unyielding character of the resistance. An obstacle to the progress of the fœtus in labor that is somewhat elastic yields to the contraction of the uterus, and permits of its extreme contraction; but if the resistance is entirely unyielding, the time comes when the uterus must be prevented from contracting further, and becoming exhausted or ruptured, and the latter catastrophe has occurred twice within my knowledge from this obstruction. We cannot be too careful, therefore, in the management of extreme cases of anterior obliquity.

Preternatural firmness of the membranes renders them capable of resisting the contractions of the uterus for a number of hours, and retarding the labor, or even tough enough to be entirely expelled without rupture. In their normal condition the membranes are protruded from the os uteri in the form of a globular sac, until they reach the perinæum; the perinæum gives the pressure a forward direction under the symphysis pubis. Soon as the whole force of the uterine contractions is brought to bear upon this anterior projection, it is concentrated upon a much smaller segment of membrane, and very soon it gives way and permits the liquor amnii to escape. In this example we have a guide to the time when the continuation of their integrity becomes useless or an impediment. If the membranes do not spontaneously rupture when the os uteri is fully dilated, and they are pressing upon the perinæum, they ought to be perforated, by pressing the finger forcibly against them during a pain.

If the *membranes are very frail*, as before mentioned, they give way at the first pressure in the very beginning of labor, and occasionally even before any other evidence of uterine contraction is discoverable; the amniotic fluid is drained off slowly until the empty uterus contracts down about the irregularities of the fœtus and thus spends its force, or much of it at least, in the different points of constriction, instead of propelling the whole fœtus downward. In breech presentation this condition of the membranes is particularly unfortunate, because this part does not plug up the mouth of the uterus, and in this way retain the liquor in the organ and maintain the regularity of outline, so important to equable contractions, as the head sometimes does, but permits a complete loss of waters and causes irregular contractions. On account of this want of adaptability as a plug to the os, in breech presentations, the membranes should be preserved entire as long as possible, or until they begin to protrude from the vaginal orifice. For the same reason, the want of proper shape of the breech for this purpose, the membranes are likely to rupture early, and hence, as one effect, artificial aid is more frequently necessary in breech than in head presentations.

A head too large for the pelvis is not a very unfrequent cause of difficult labor, even when the maternal organs are in every respect normal in size. The disproportionate size may be simply an unusually large but healthy head; or the head may not be too large, but so firmly ossified that the ordinary compression will not take place. In this last kind of cases the sutures are filled up by ossification, and the posterior fontanelle has entirely disappeared, while the anterior is very much diminished in size from the same cause.

Hydrocephalic Enlargement of the Head.—But the head is sometimes enlarged from an increase of the arachnoid fluid —hydrocephalus. The head may be very much increased from this cause. I once delivered a head by perforation that, redistended, measured twenty-four and a half inches around just above the ears. I have had the personal care of three cases of intra-uterine hydrocephalus. One was in a patient with the third child; this was the one that measured over twenty-four inches in circumference. The uterus became exhausted and ceased to act after a continuance of effort for twelve hours. There was not even an attempt at contraction after twelve hours. This was dated from the time the os uteri was developed and the liquor amnii evacuated. There was no other sign of exhaustion. The pulse was good and natural in every particular, the surface cool, the mind calm and quiet, and the stomach free from disturbance. As before stated, this head was perforated, and a large amount of water drawn off, when it was not difficult to extract the head, which collapsed as it passed out like a leather bag, the bones were so flexible. Another case terminated spontaneously after a hard labor of about fourteen hours'—second stage—duration. This head was six inches antero-posterior diameter, but when delivered was collapsed as though it had been perforated. I examined it with the full expectation of finding some opening in the scalp. This was not discovered, but an explanation was given by a ruptured spina bifida at the upper part of the sacrum. By squeezing the head between the hands the fluid could be made to pass out through the opening below. The pressure of the uterus upon the head had doubtless pressed the fluid down the spinal canal with so much force as to rupture the spina bifida, and thus bring relief by evacuating the fluid through that opening. The other was not nearly so large.

The fœtus presented breech foremost, and the labor became very tedious, and upon bringing the breech through, the head was arrested at the superior strait, and could be delivered only by perforating the cranium near the mastoid process. The diagnosis is not difficult. The elastic feel of the parts, as compared to the head in an ordinary condition; the fact of its filling up every portion of the pelvis, advancing before the uterine efforts, and immediately with a bound receding, not merely into the pelvis, but to the upper strait; this advance, as though some part was ready to pass the external organs, and the sudden and distant recession, are almost characteristic of the hydrocephalic condition of the head. Prof. Meigs, in his excellent treatise on obstetrics, describes a tumor of the scalp, resembling in character a spina bifida, larger than an ordinary fœtal head, containing arachnoid fluid. Such cases are all treated alike by perforation and evacuation.

The abdomen of the fœtus is sometimes so enlarged that it is impossible to bring it through. The enlargement may be the result of an accumulation of gas evolved by decomposition of the organs within it, or there may be a true ascites, and the accumulation of fluid within the peritoneal cavity. As the obstruction cannot be recognized until a portion of the fœtus has been expelled, we should first endeavor to draw the child through the pelvis, and, finding this impracticable, we must perforate and allow the contained fluid to escape, when traction will finish the delivery.

Short funis is mentioned as the cause of difficult labor, but in all authors that I have examined upon the subject—and I have certainly not seen an instance of the kind—I am in doubt whether it is an imaginary or a real one. I am inclined to think the former.

Monsters.—We sometimes meet with monsters in size, or in shape, of sufficient dimension or irregularity of figure to give us much trouble. Single monsters are much more likely to be deficient in some part, and less in size and weight, than the contrary. Perhaps the kind most frequently met with are deficient in the skull and brain, having only the face, base of the cranium, and a rudimentary scalp, covering only the cerebellum and medulla oblongata—and these generally imperfectly formed—and some serous fluid; or deficiency of one limb or more, or absence of a portion or the whole of the abdominal muscles. These sorts of monstrosities, however, do not give us any trouble in delivery on account of their peculiarities. It is only when some portion of the fœtus is greatly enlarged, or there is a redundancy of members; where there are two heads and four arms implanted upon one broad chest, or two almost, or quite, complete individuals joined together at the chest, sacrum, or other portion of the body. We can hardly diagnosticate the existence or the character of monstrosities, hence our treatment of them must depend upon a careful consideration of the case as it arises. It is singular what

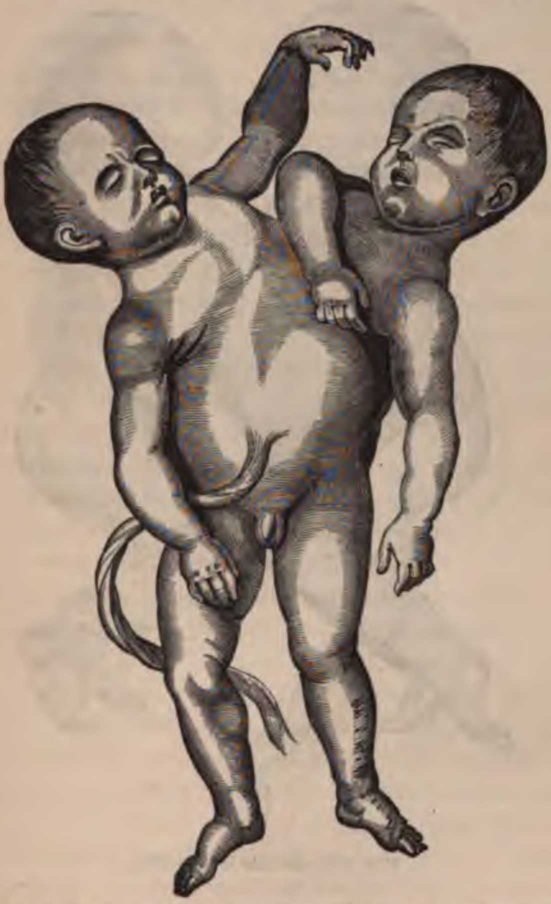


FIG. 118.—Specimen of Monstrosity with double head and shoulders.

the resources of nature are in these double-headed and double-bodied monsters. Although the great majority of them are born dead, and the only means of removing them consists in attacking the presenting part with the sharp or blunt hook, or both, and diminishing the size of it—when it cannot be brought through without—in some instances, where they are deficient in size, they will be expelled quite readily by the natural powers. Conjoined twins, somewhat diminished in size, may be delivered sometimes without any violence. If joined at the sternum, side of the chest, or sacrum, the head and body of one is expelled up to the point of junction, and then the two bodies are expelled breech before,

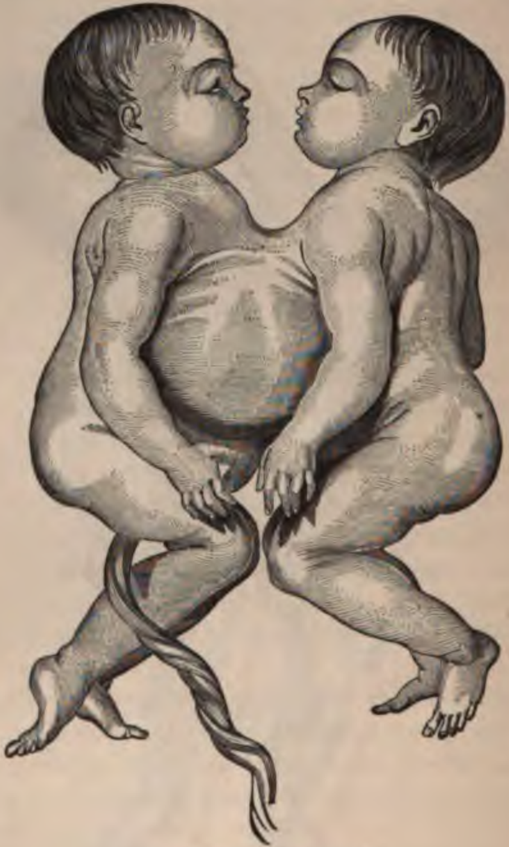


FIG. 119.—Double Monstrosity.

and the head and shoulders of the last expelled after them. The double-headed monster mentioned by Prof. Meigs, was delivered by having one head expelled first, up to the shoulder; this remained forced up against the pubis, while the body was bent upon itself, until the breech came down. The other head and shoulder followed.

DIFFICULTIES REQUIRING INSTRUMENTAL DELIVERY.

As it has been found convenient and the most profitable way to review the causes of tedious labor together with those of instrumental, because in their *nature* they were inseparable, and differed in this respect only in degree, so it will be advantageous to consider the indications for the use of instruments together; for while there is some difference in the indications that require the use of the forceps from those that demand the employment of instruments which mutilate the fœtus, they are often undistinguishable, and may be determined only by trial.

The causes giving rise to these indications fall into two definite classes. The first leading to conditional indications for instruments, *i.e.*, the cause may produce merely tedious labor by its moderate hindrance to the expulsion of the fœtus. The difficulty may be overcome by the action of the uterus, or it may require assistance. The causes thus classified are, inefficient labor-pains, rigidity of the os uteri, obliquity of the uterus, and moderate contraction of the pelvis. They are causes that may simply cause tedious labor, or, by being a little greater in degree, make the use of instruments necessary. The absolute indications can be so determined from the beginning, and the causes are such as must be overcome. These are, greatly contracted pelvis, tumors of the pelvis, hydrocephalic head, too large a head, etc. These causes render labor impracticable; for it is a stretch of propriety to call instrumental delivery labor, more especially when the delivery is effected by destroying and dismembering the fœtus. The conditions that fulfil the indications of the first class add *force* to the efforts of the uterus merely; those fulfilling the indications of the second class *remove the obstruction*, or mutilate the child so that it will pass the obstacle. The instruments, therefore, that answer both of these purposes must differ very decidedly in their qualities and capacities. The instruments to answer the purposes of the first indications must seize the fœtus, and enable us to draw the child out of the passages; and as the difficulties are not of the worst kind, one capacity of the instruments enables us to remove the fœtus without damage to the child or the parts of the mother. This class of instruments may be termed extracting, and are intended to save the child, while the mother is relieved. The forceps belongs to this class. The second class of instruments are for the destruction of the obstacle or the child—generally the latter—for the safety of the mother alone. These are properly termed destructive instruments. The perforator and crotchet are of this class.

There is also a decided difference in the effects of these two classes of causes. The damage done by the causes of the first class is almost always exhaustion, nothing more. That resulting from the second class of causes is wrought upon the organs engaged in the acts of labor. Inflammation of the uterus, from violent and protracted efforts; inflammation of the vagina, from long-continued and severe pressure by the parts of the fœtus being so strongly urged into it; rupture of the uterus, or laceration of the vagina. In addition to these last effects, the second class of causes may, by protracting the labor to an unusual extent, bring about exhaustion; but inflammation of the uterus or vagina, or rupture of these, cannot result from the action of the first class of causes. By determining the character of the cause which is producing the difficulty in labor, we may almost certainly see the character of the instruments we shall probably be under the necessity of using. If we are in doubt as to whether we have difficulties belonging to the second or the first, the instruments of the first class should be employed, and if they fail those of the second may be employed afterward as a last resort.

The indications for the use of instruments should be clearly understood. I have just stated the damages that result from the action of the causes of difficult labor, and the practitioner would be culpable who should wait at the bedside of his patient until she had sustained a terrible injury. It is his business to *prevent all damage*, by discovering its approach and applying the remedy in due time, instead of using the means of relief after his patient is ruined. The most common of all the indications for the use of instruments is the approach of exhaustion: the failure of the powers of the uterus and the general system. The failure of the uterus almost, if not quite, always becomes obvious before any great amount of damage is done, and it is the first evidence of exhaustion. If the pains of labor have been strong and frequent, their strength gradually decreases, the frequency becomes less, until the pains lose all their propulsive effects, and the presenting part does not move forward. I have lately witnessed one remarkable instance of this kind, resulting from hydrocephalic head, when the pains entirely ceased, and the presenting part receded above the pelvic brim, although the os uteri was completely open, the liquor amnii evacuated, and the presenting part had been at one time protruding between the labia, and momentarily expected to be expelled by the attendant; serving as an instance of an elastic obstruction exhausting the uterus instead of stimulating it to damaging activity, as the solid unyielding obstructions often do. The first symptom of exhaustion, then, is the failure of the uterus, more or less completely. It is seldom that we do not witness other symptoms very soon after the pains begin to grow decidedly less in efficiency. Vomiting is one of these, and as nausea and vomiting are symptoms attendant upon dilatation in the first stage, we must not mistake the one for the other. The circumstances are generally sufficient. In the vomiting from dilatation, the mouth of the uterus is not entirely open, the pains are active and increasing; the matters ejected are ingesta, merely the food the patient has eaten, or the drinks she has taken. The vomiting of the first stage is seldom sufficiently violent to cause bile to be ejected. Vomiting from exhaustion ejects all the alimentary contents of the stomach when they have not before been evacuated, and then bile is seen in the discharges; soon they become acid and greenish, and if the exhaustion proceeds to a grave degree, the ejecta become grumous and resemble coffee-grounds. The difference in the substance thrown up in these two conditions may be stated thus: in the vomiting from dilatation, the ejecta are the healthy contents of the stomach; the ejections in the vomiting from exhaustion are the vitiated products of the stomach. In this last, acid, bile and mucus changed by acid, are finally the extremely changed contents of the stomach described as the coffee-grounds or black vomit, and similar in all respects to the same sort of ejections in fevers, at their termination in exhaustion. The pulse is increased in frequency and becomes feeble in exhaustion. Instead of seventy-five or eighty strokes in the minute, it runs up to one hundred, and then a hundred and twenty, and even up to one hundred and fifty beats to the minute. One hundred to the minute, continuing permanently, and rising in a labor, is a sure indication of mischief, and admonishes us that interference is then necessary; and we fail to do our duty if we do not search diligently for the cause, and at once make an effort to remove it. When the pulse attains a rapidity equal to one hundred and twenty strokes to the minute, grave mischief has already been done, and if the cause is removed our patient is still in jeopardy because of the effects already produced. With these symptoms there is often chillness, actual coldness, sometimes with tremors. In the stage of dilatation, the tremors are not attended by chillness; they are nervous trembling; but this is chillness. There is also dryness of the mouth; that, as the condition of exhaustion advances, becomes very dry, the tongue is hard and coated brown, and the teeth covered with sordes. The mind is wandering, either in muttering delirium or wild frenzy; the temperature of the body is cool and bathed in an exudation, for it can hardly be regarded as perspiration. These latter symptoms are indicative of *mischief done*, and ought not to be allowed to occur. I insist that the obvious failure of the pains of labor in the second stage, with vomiting of vitiated ejecta from the stomach, and a pulse one hundred to the minute, and increasing, are indications for interference, indicating a failure of the natural powers and showing the necessity of interference. They are evidence of incipient mischief that, with a continuation of the labor, will almost certainly become dangerously grave, the exceptions being too rare to require a consideration.

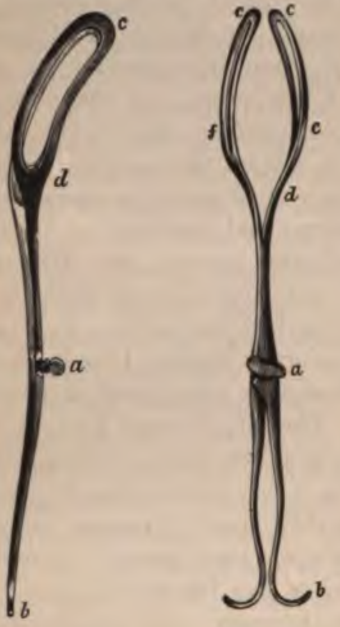
We cannot estimate the probabilities of serious exhaustion by time, no more than we can calculate any other kind of physical endurance by the hour. The length of time required for these symptoms to come about depends upon the violence of effort and the capacity of the patient for enduring her suffering, and can be measured by symptoms only, hours and minutes not entering into the calculation. Time was probably the best measurement Denman and Hunter could give the large body of practitioners of their day, but certainly we can trust the intelligence of the profession now with symptoms as their guide in obstetrical as well as other practical branches of the profession. A "meddlesome midwifery is bad" only when the interference is based upon wrong principles. In midwifery we interfere to *save our patient from damage*, hence we must anticipate it by discovering its approach by symptoms, not by time. I have not attempted to give all the symptoms of exhaustion. Dr. Ramsbotham mentions a peculiar yellowish vaginal discharge as one, indicating changes in the condition of the mucous membrane of the uterus.

The second indication is inflammation of some of the parts concerned in labor; and the symptoms indicating inflammation may be mingled with those denoting exhaustion. This is especially the case where the inflammation has not been discovered in the beginning, and exhaustion has supervened as the effect of the same causes, giving rise to the inflammatory condition. Although the uterus is sometimes the subject of inflammation, it is rarely so compared to the vagina. When, from long and violent exertion, inflammation of the uterus precedes exhaustion of muscular power in it, there is tenderness upon pressure or the slightest touch, so that the patient cannot bear to be touched or handled freely; the pains, although they may not be more than ordinarily efficient, and perhaps less so than usual, cause excruciating suffering on account of the tenderness of the organ. There is increased heat of the skin, thirst, and a more than ordinarily fickle pulse. Instead of being weak, as in exhaustion, the pulse is sharp and corded. Tenderness of the uterine globe, the peculiar pain and febrile heat, will warn us of the danger arising from inflammation of the uterus.

Inflammation of the vagina, bladder, and other parts in the pelvis is another, and often becomes an urgent, indication for the use of instruments. The pelvic organs suffer in this respect as the effect of continued severe pressure by the presenting parts. The head is advanced into the pelvis, perhaps almost through, and on account of the narrowness of the pelvis or large size of the head it is arrested, and remains closely impacted, pressing the soft tissue of the vagina and bladder against the pubis or sides of the pelvis, or the wall of the vagina and the rectum behind, embarrassing the capillary circulation and thus bringing about a very destructive form of inflammation. This is the way *impacted head*—a head arrested in the pelvis notwithstanding the powerful action of the uterus—acts in causing mischief. A head is sometimes *arrested* in its passage through the pelvis, however, without being impacted or crowded, in consequence of inefficient uterine action. After arriving at the perinæum, and perhaps pressing open to some extent the labia, the pains become less efficient and the head remains stationary. A head, arrested from this or any other cause, remaining in the soft parts, even when there is ample room for expulsion, will cause inflammation, but it requires a much longer time to effect it. Hence time is no measure of the damage likely to result from the lodgment of the head in the pelvis. In four hours a head arrested from impaction under the influence of efficient labor-pains may, and would be likely to, awaken a very destructive form of inflammation, and thus irreparable damage; but a head lodged in the pelvis, on account of the want of force to push it through a pelvis well proportioned to it in size, may remain double the time without serious mischief. It will not be difficult for the student to understand the difference between the head impacted from want of room and the head arrested from want of uterine force. The impacted head fills the pelvis, so that it is difficult, if not impossible, to pass the finger between it and the bones of the pelvis; in the absence of pain it cannot be elevated or otherwise moved; the pains do not cause it to advance, nor does the elasticity of the soft parts cause it to recede in the absence of the pain. The head arrested from inefficient pains does not fill the pelvis so perfectly but that the finger may be passed up between it and the bones of the pelvis; the pains even of moderate force do advance it, and the elasticity of the soft parts causes it to recede somewhat. In the absence of pain the head may be moved without difficulty by the finger. In either of these conditions the parts, after a time, begin to suffer from the pressure,—in the case of the impacted head very soon. The vagina becomes dry and hot, and tumid, so as to increase the obstruction. In many instances the mucous membrane becomes very tender to the touch, but in some others it is very insensible. At the same time there are febrile symptoms, the pulse increases in frequency, the tongue becomes dry. Perhaps these symptoms may have been preceded by chilliness. If not relieved the patient becomes exhausted, and all the symptoms I have enumerated indicating that state are established. This is the kind of cases that are succeeded by post-partum vaginitis, sloughing of its tissues, vesico-vaginal and recto-vaginal fistula, if not by fatal metritis, peritonitis, or perimetritis. We should anticipate the grave symptoms resulting from impaction, and thus prevent serious damage by operation, as soon as we become satisfied of the arrest of progress. In most cases the forceps is the instrument indicated, and we will be more likely to save the mother and child both by operating early. It is to prevent the occurrence of this inflammation that we exercise our skill, and this cannot be done if we wait until it is established. As before intimated, we cannot derive our indications for obstetrical practice from time, but must watch the symptoms. The degree of force and impaction is very different in different instances, and the susceptibility is not the same in all cases. The vagina may become intensely inflamed in two or three hours, while in other cases it might be ten or twelve. Hence, I do not believe that it is philosophical to say that if the head remains stationary for four hours we must remove it; but if thus we are to be governed by time at all, we ought not to let too much of it pass in a state of inaction. In fact, so soon as the head is at a stand-still, and the parts begin to swell and become dry, if it is only one hour, we are called upon to interfere. A third indication for the use of instruments is the danger of laceration of the uterus or vagina. The action of the uterus, when opposed by an inelastic obstruction, as contracted pelvis, bony tumor in that cavity, or the improper position of the head, as in great obliquity or malpresentation, is sometimes increased to a fearful extent, the pains rapidly increase in frequency, duration, and power, until damage to the soft parts results. I have mentioned elsewhere a case of rupture of the uterus from this cause, on account of arrest of the head from great obliquity. The commencement of this tumultuous uterine action should warn us that it will cease only when the obstruction is overcome, complete exhaustion is reached, or such damage is done to the organs as will render them incapable of further effort. Two or more of these indications, as the student would infer from the description, are not unfrequently present in the same patient at one time. Exhaustion and vaginal inflammation form, together, very bad cases. Great vaginal tumefaction and inflammation are not unfrequently the results of the obstruction and tumultuous action that indicate the necessity of interference, and add to the hazard of the situation. In what I have said with reference to these three indications, I have had head presentations more especially in view; but we may look for them occasionally in breech presentations. I have known more than one instance of arrest of the breech in the pelvis followed by severe inflammation of the vagina, sloughing, and in one vesico-vaginal fistula. The long-continued pressure of the parts in shoulder presentation, where eventually spontaneous evolution terminated the case, was the cause of sloughing that laid the bladder and rectum both open.

The bladder and rectum should be empty, as an absolute prerequisite to the use of any sort of obstetric instruments through the vagina. The catheter should always precede other instruments. If necessary, injections should be given to evacuate the rectum.

The extracting instruments are used to save the life of the child as well as to relieve the mother, and they are constructed with a view to avoid damage to either. They are the forceps, extractor, vectis, and fillet. *The forceps* have almost entirely superseded all other instruments of this class, and, unless for special reasons, is the most efficient and in every way desirable means of delivering the child where it is practicable to save uninjured both mother and child. Dr. Ramsbotham calls this class of instruments innocent as compared to the others, and Dr. Meigs speaks of the forceps as the child's instrument. Forceps are constructed so as to enter the vagina and uterus and embrace the fœtal head much in the same way as if the hands were inserted, one on either side. The blades are so constructed as to take firm hold upon the head with a uniform and equable pressure, without pressing to an injurious degree on any one point. In some form or other they seem to have been used as far back as Celsus; and Avicenna, who flourished in the eleventh century, makes mention of it in such particular manner as to enable us to recognize in the instrument the same general characters it now possesses. It seems, however, to have been lost and forgotten until Dr. Paul Chamberlen, either from having found traces of it in the Arabian authors or in his own inventive genius, produced the instrument anew, and so perfected it as to make it efficient, and earn for himself, and several sons who followed him, both fortune and fame. The Chamberlens carefully and successfully concealed their instrument, and for a long time were the only proprietors; but it would seem that by some means, and that too without their consent, the instrument and its uses were found out. And we find that about the same time Dr. Butler and Dr. Chapman published descriptions of it, so that the profession came fully in possession of it. Dr. Butler's description was published in the Edinburgh Medical Essays for the year 1733, and Dr. Chapman's account of it was given in the third edition of his "Improvements in Midwifery," and illustrated with several drawings (Playfair, Operations in Obstetrics). As I have before stated, Chamberlen's instrument was efficient and useful, probably not much less so than the straight short forceps of the present time. It was straight on the sides, and instead of a lock to join the two parts, the blades were perforated and a cord was passed through the perforations to retain them in contact and position during the application of force for the extraction of the child. Important improvements have been made since the time of the Chamberlens, and many more attempted with partial, if not complete success. The English furnished it with a "lock," or shaped the centres of the two branches so that they fit into each other and form a solid connection. This adds to the convenience and usefulness of the instrument. In place of the cord, the French have fashioned a movable rivet, that, when the instrument is placed on the head of the child, is passed through the perforations of the two branches and fixes them together. As before remarked, Chamberlen's instrument was not curved on the side, to adapt itself to the axes of the pelvic straits and cavity. The English and French, in the persons of the eminent Smellie and Levret, about the same time added the lateral curve, forming it into better shape to pass high up into the genital organs, without heavy pressure anywhere. Finally, Chamberlen's instrument was short, and one form of the forceps of to-day is long enough to pass beyond the pelvic brim and remove the fœtus from the abdomen. Still another important improvement has been added to this useful instrument in America by our contemporary, Dr. George T. Elliot, of Bellevue Hospital Medical College. It consists of a movable pin, situated so as to retain the branches at any given proximity, and thus avoid the mischievous pressure that is sometimes unwittingly made in the hurry and embarrassment of a difficult and tedious operation. If this improvement of Dr. Elliot was added to every forceps, I have no doubt it would result in the saving of the lives of multitudes of children. I will refer to this instrument again in the proper place. In addition to these real and important improvements there have been a multitude of alterations of shape, size, etc. In selecting forceps there are several considerations the student should bear in mind. Forceps with a broad blade or claw is rather more difficult to fix upon the head, but it also takes a firmer hold and is less likely to slip. A curved forceps takes a firmer hold than the straight, but is not quite so easily applied, while a narrow forceps passes in and assumes position easily, but may slip off. As examples of American forceps, Elliot's is light, graceful, safe, and easily used, while Hodges' is strong, capable of taking a very firm hold, makes powerful compression and extraction. Both of these instruments are susceptible of being used at the perineal strait in the pelvis, and above the superior strait. The difference in the length of forceps consists in the difference of distance from the lock to the extremity of the blade, and some long forceps have short handles, and some again quite short. Forceps with short handles are not capable of compressing the head of the fœtus so powerfully, but are efficient extracting



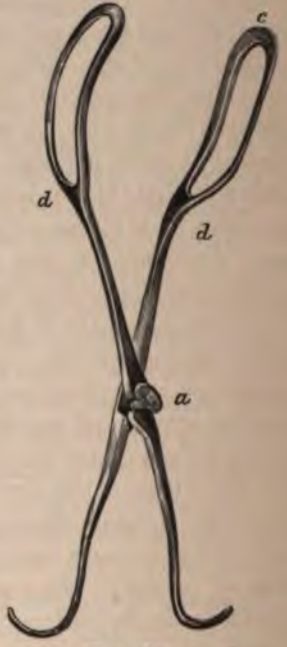


FIG. 121.

FIG. 120.—HODGES' FORCEPS.—*a*. Lock. *b*. Outward extremity of handles. *c*. Extremity of blade. *d*. Junction of blades and handles. *e*. *f*. Convexity of the blades.

instruments. With the long handles we may manage an instrument more easily, but with careless management we are likely to do more damage than with short handles. An operator should possess a short, light, straight forceps for ordinary use at the inferior strait and within the pelvic cavity, Elliot's forceps to use for extracting the head from the superior strait, and Hodges' for compressing when necessary, and with which to make powerful traction.

I speak of these instruments because they are models of the best quality, each having its own excellences, and being familiar to most American practitioners; but there are other modifications that answer all the purposes of these instruments very well. The forceps of which most of the long-curved instruments are modifications—I mean those invented and used by the late Dr. Davis, of London—is an admirable instrument, and susceptible of being used in almost any position of the head in the pelvis, and possesses a powerful grasp, the large fenestra making them firm and reliable when once applied.

Forceps should be made of the best tempered steel, to permit of some spring, bear powerful traction, and not be easily broken, and they should be as light as consistent with the strength required for their use. The German and French forceps are generally unnecessarily heavy, weighing sometimes several pounds. The blades should be highly polished, and all the edges rounded smoothly, so as not to cut the scalp or fracture the bones of the skull. It was the fashion at one time to cover them with leather, or some kind of cloth, with the idea that the covering protected the soft parts of the mother and child from harm. The concave portion of the blades for apprehending the head should be six and a half to seven inches long, to accommodate the head when elongated by the pressure of passing through the pelvis, or applied by the instrument itself. When the instrument is locked, the extremities of the blades approach each other within three-quarters of an inch, and the concavity of the blades must be skilfully fashioned to fit the rotundity of the head without pressing injuriously on any particular part. The instruments I have named possess these qualities, and, as they are well-known patterns, can be procured of instrument-makers almost anywhere. The reader will remember that while I speak of the use of the short and long forceps separately, the long forceps may be used in all situations where the short will answer the purpose, and that the short is an instrument of convenience as compared to the long. We may use the short forceps at the perinæum or in the pelvic cavity, while they cannot be efficiently used at or above the superior strait, the long instrument being adapted to these positions. The short straight forceps will answer all purposes when the head is arrested in the pelvis on account of the want of uterine force to expel it, as from inefficient labor-pains when the patient is exhausted; when the soft parts at the inferior strait resist its passage, or even when there is slight contraction of the pelvis, especially at the inferior strait. There is quite a large class of cases that require the use of the forceps, when complications arise to require the immediate termination of labor, as hemorrhages, convulsions, etc., that will be treated of in another place in detail. The long forceps, being a longer and more powerful instrument, is used when the difficulty to be overcome is greater, when the head is arrested high up in the pelvis, on account of slight contraction, and the relief of complications when the head is at or above the superior strait. The long forceps, as has been already intimated, is used as an extractor when the head and pelvis are properly proportioned, and it is made to act as a compressor when the head is large, or the pelvis rather small for its passage; and hence in doubtful cases, when we cannot positively determine whether the relative dimensions of the head and pelvis are such as to render labor impracticable, it is our duty to try to effect delivery with it, as giving the child some chance for its life, for we know that the head will bear a great amount of compression and not sustain fatal damage. The short straight forceps should be applied to the sides of the head always, in whatever position we find it. The long curved forceps may generally be thus applied when the head is low in the pelvis; but if it is high up, or strongly impacted, this is not practicable, and hence we are sometimes compelled to apply the long forceps in such instances with reference to the curve of the pelvis, and without regard to the position of the head. The head is therefore, at such times, generally seized in the diagonal diameter. It will be understood by an examination of the curved instrument that the curve is intended to adapt itself to the direction of the axes of the pelvic cavity, and that when we introduce it crosswise, or diagonally, with reference to the pelvic curves, that there is much danger of touching the sides of the pelvis with the ends of the blades, and bringing them in contact with the ramus of the ischium at the outlet, and thus dangerously contuse the soft parts at these points. I think, indeed, that there is very much more damage done to the soft parts of the mother by making this diagonal application of the curved forceps than there would be if the rule was to use them with reference to the pelvic curves entirely. One advantage in using the short forceps is the ease with which rotation occurs spontaneously, and the facility with which it is effected when it does not take place spontaneously. Before either the short or long forceps is used, the os uteri must be largely dilated, so as to admit the blades without contusing or lacerating it. Dr. Meigs insists upon complete dilatation and recession, so that the cervix is entirely out of the way; but I think there are cases where the delay would be needless, if not injurious. The dilatation should be large enough to permit the introduction of both blades easily; probably a diameter of three inches from side to side would be sufficient for the straight forceps, but the curved will require more. Something will depend upon its dilatability also. If it dilates readily and easily we need not wait so long; but if the os is rigid and unyielding, if we could introduce the instrument, there would be great certainty of lacerating it by the delivery. If cases occur with such conditions of the os uteri, in which delay would jeopardize the life of the woman, and the parts can be artificially dilated by nauseants, gentle use of the fingers, etc., this ought to be done; but if the dilatation in this way is impossible, and the instrument can be introduced, the practitioner should intelligently weigh the hazard of laceration against the danger of delay, and make the decision. And if extremity demand, we can resort to incisions of the os uteri, as directed for insurmountable rigidity under other circumstances. The bladder should be empty, and the rectum evacuated. If this can be done voluntarily, that is the best way; if not, the catheter and injections should be resorted to.

When we find ourselves under the necessity of using instruments, it is a question whether we should take the whole responsibility, or call a council to share the responsibility and sanction or correct our judgment. I am strongly inclined toward counsel in such cases, as eminently proper, and with young members of the profession, by far the best course in every way, unless the loss of time required to procure it is of material disadvantage to our patient. The patient is to be placed in a position that will give us the greatest facility in the use of the instruments, which is on her back, across the bed, with the vulva projecting slightly over the edge of the bed, limbs widely separated, and held firmly by an assistant at each knee. In order to maintain this position without inconvenience, each foot should be placed on a separate chair. The shoulders should be elevated also. I think there can be no doubt, at this stage of the proceeding, as to the propriety of giving our patient ether to anæsthesia. The practitioner should remove his coat and take his seat in front of the patient, and as nearly as possible between her knees. His arms ought to be bare, and the muscles free and unconstricted anywhere. Before determining the mode of proceeding, the exact presentation and its position must be determined. If this cannot be done by one finger, we may introduce two, or even half of the hand, to reach such parts of the head as will be distinctive and definite starting-points from which to make our calculation. If the head is so moulded and disfigured, and tightly impacted, as to make it impossible to do this, we will be right in a large majority of cases to regard it as first position of the vertex, such as is the most common—the vertex to the left groin. This necessity, however, will be extremely rare, for we may generally, without much difficulty, make out the position quite accurately. The preparation of the instrument should next claim our attention. It should be placed in a basin of water about, or very slightly above, the temperature of the body, and within our reach, and when we remove it from the water—which we should do one blade at a time—we wipe it dry with a towel and apply some kind of oil to the portion to be introduced until it is thoroughly lubricated.

Application of the forceps after the vertex has turned to the symphysis.—This is a simple and easy operation. The left-hand blade, or the blade that enters the left side of the pelvis, should be introduced first, and will be under the other when they are placed in apposition, ready to be locked. If the forceps is straight, this blade may be known from the other by having the portion of the lock that receives the other into it. This is sometimes called the female blade. But in some short straight instruments both parts are made exactly alike, and then it does not matter which is used on the left side and introduced first. In either case, this blade of the instrument is to be taken up by the left hand and held lightly by the thumb and two fingers, in a perpendicular position over the vulva, while the two fingers of the right hand are introduced as high as they will extend alongside of the head, and between it and the left side of the pelvis. With these fingers we ascertain what is the condition of the os uteri. If it is not completely dilated, and passed up over the head beyond reach, the fingers must be inserted between the uterus and head, and there retained as a guide to the instrument. The point of the forceps blade is now very gently passed into the cavity of the vagina along the inside of the fingers and in close contact with them. So soon as the blade has entered two or three inches, the hand containing the instrument is passed over toward the right thigh of the woman and depressed. This manœuvre will bring the concave surface of the blade in contact with the round side of the head. The instrument, thus between the head and the fingers, and held in such position as to permit it, should be pressed gently upward until the head is perfectly embraced by the concavity of the blade. The handle should be pressed back against the perinæum, and there held by an assistant. The other blade of the instrument should next be taken in the right hand, in the same manner and position, while the fingers of the left hand are introduced high up between the pelvis and head, inside the os uteri, if this is not dilated, and the instrument passed between them and the head, until completely adapted to that side of the head. The handle of this part of the instrument is carried down to the first blade, and if both are properly introduced it will fall into the lock and their junction will be secure. If not placed accurately upon the sides of the head there will be a want of correspondence in the direction of the surfaces of the blades, and the one that seems most out of place should be carried around in a gentle way to the proper place. The application and locking of the instrument will be very easy in this position of the head; but we sometimes find it difficult to lock the two blades together. After getting them as nearly right as we can, we may often succeed perfectly by pressing both handles back against the perinæum, so as to force this part back in such a way as to bring the points of the blades more in the axes of the pelvic cavity. All this manipulation should be done with the utmost gentleness, and in the absence of pain, resting between the uterine contractions. The most difficulty the inexperienced meet with in the introduction of the forceps depends upon a want of reflection, and adaptation of the instrument to the axes of the different parts of the pelvis. The points of the instrument must enter the vagina in correspondence with the perineal axis, and pass into the pelvis in the axis of the inferior strait, and, when completely introduced, in some of the axes of the pelvic cavity, according to the distance they go into that cavity. Another thing that is not well remembered by the young operator is the necessity of carrying the handle of the instrument across the median line so as to suit the curve of the instrument to the rotundity of the head. In all instances we should take the time to run over the whole of the process, every step in the operation, before we take the instrument in hand. This will insure the calmness and deliberation so necessary to success in any delicate operation. When the forceps is locked, the handles may be pressed together with firmness enough to keep it steady during traction, and this pressure should be entirely relaxed when we are not drawing upon it. There is no need of tape or other ligature around the handles, as there is no danger of the blades being displaced in the absence of exertion, and the left hand will press them together strongly enough during traction to keep them in place. I like the direction of Dr. Meigs, to pass the middle finger over the lock with which to do the traction, while the forefinger is kept in contact with the head, to be constantly assured that the instrument is not slipping over the convexity of the head, and, if this accident should occur, to warn us of it in time to relax our efforts before laceration may have resulted.

With these preparations and precautions, all accomplished and in mind, we may begin our traction. We wait until evidence of uterine contraction is manifest, then we make traction in the direction of the axis in which the head is situated. In the position we are now considering, traction is to be made in the direction of the axis of the inferior strait until the perinæum is strongly distended, and then, by turning the handles up, draw in the direction of the perineal axis, which is forward and upward, around the arch of the symphysis. The head should be kept close to the symphysis until it has emerged from the vulva. In executing this part of the operation there is danger that the points of the blades are made to press too strongly on the perineal structure as they sweep around this curve, or that we bear harshly upon the rami of the ischium with the upper edge of the blades. We can foresee the first danger by keeping one hand on the perinæum, where we may feel the ends of the blades through the attenuated perinæum, and the second by the forefinger used to keep them in contact with the head. We should be in no great hurry to bring the head through with the forceps unless there is some special reason. We should be satisfied to add something to the progress caused by the pains, if these still continue, or if they do not, to imitate the gradual manner of expulsion by them. In making traction the forceps should be swayed from side to side very slowly at the time we draw upon them. When the head emerges from the vulva the forceps should be removed with great gentleness, for generally there is still some part of the blades within the cavity of the vagina. The uterus will, in a short time, expel the body; or, if it does not, we can hook a finger within the axilla and aid the expulsive efforts of the organ. Sometimes, when the obstacle to expulsion consists in narrowness of the inferior strait, so soon as this obstacle is overcome, and the head is advancing under good strong pains, we may remove the instrument before it emerges from the vulva.

APPLICATION OF THE FORCEPS WHILE THE HEAD IS WITHIN THE PELVIC CAVITY AND BEFORE THE VERTEX HAS TURNED TOWARD THE SYMPHYSIS.

If the head is situated with the vertex toward the left groin of the woman, or in the first position, the left-hand blade is to be introduced first, as directed before, and after the blade has fully entered, it is placed with the convex or back part opposite the left sacro-iliac junction, and intrusted to an assistant. The other blade is introduced opposite this. We will sometimes accomplish this quite well by depressing the handle of the second blade between the limbs of the patient, and passing the point of it into the vagina between the head and pelvic bones, opposite the right cotyloid cavity or a little anterior to it. If this is practicable the blades will lock as soon as the last is completely introduced. But unless there is plenty of room we will find this method of introducing the second blade difficult, if not entirely impracticable;

and the easier plan, as a general rule, is to introduce the second blade to the right side of the pelvis just anterior to the right sacro-iliac synchondrosis, and after it is completely within the cavity, to change its position by gently sweeping it around forward until it assumes a position opposite the first. The caution that no force is to be employed in executing these movements cannot be too emphatically expressed, or too strongly impressed upon the mind of the operator. The instrument locked and held together as before directed, we will find that instead of one blade being on either side of the pelvis they are diagonally situated, the one to the left very decidedly behind the other, and the whole instrument oblique. Before proceeding with extraction we should pass one finger along the one most anterior, and satisfy ourselves whether it is applied exactly over the side of the head and firmly fixed. This precaution is the more necessary—if the blades of the instrument are narrow and straight—to avoid slipping. Traction should be made in the direction toward the coccyx until the perinæum is somewhat distended, when the position of the forceps, if they do not spontaneously turn, should be changed, so as to bring the blade first introduced opposite the left sacro-iliac junction, forward to the side of the pelvis. This change ought to be completed when the perinæum is strongly distended. After the change is effected the situation is as we found it in the condition first described, and the delivery must be effected as directed for it, viz., by elevating the handles so as to cause the occiput to pass close against the symphysis until the head emerges from the vulva. The rotation of the occiput generally occurs spontaneously, as in unaided labor, especially if the straight forceps is used.

APPLICATION OF FORCEPS WHEN THE VERTEX IS TO THE RIGHT SACRO-ILIAC JUNCTION AND THE FOREHEAD TO LEFT GROIN.

The introduction of the different blades is the same as in the last described position of the presentation. After the instrument is locked, and we have satisfied ourselves by the usual examination of the correctness of their adaptation, with the first pain, in addition to making traction, we commence rotating the head, so as to bring the vertex to a point opposite the right acetabulum, effecting it gently and slowly during each pain.

It will be remembered that in the description of the mechanism of labor with this position of the vertex, there is a spontaneous change of this kind effected by the ordinary action of the parts concerned, and very little artificial aid will generally suffice

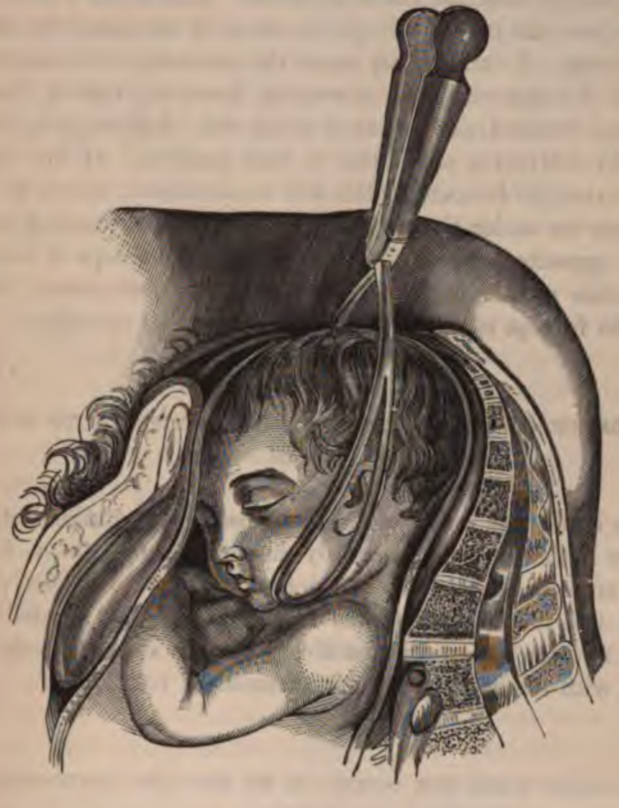


FIG. 122.—Application of the short forceps with face forward.

to accomplish this desirable rotation. In doing this the instrument will turn, so that at one time the blade that was introduced into the left side of the pelvis opposite the sacro-iliac junction will be in the hollow of the sacrum, while the other will correspond with the symphysis pubis, and at the conclusion of the operation the blades will have exchanged sides. After we have effected rotation to the point that places the occiput opposite the right groin, our traction may be more decided until the perinæum is somewhat distended, when we may slowly complete the rotation.

The occiput being under the arch of the symphysis, the assistance will be as in the condition described at first. This complete rotation cannot be executed with the curved forceps without removing it when the convexity is brought opposite the symphysis and reapplying it with the curve forward. This is an awkward necessity, and the operator ought to avoid it by using the straight instrument. I must insist upon the necessity of removing the curved forceps when the convexity, from any reason, has been changed forward, as there is so much risk of damage to the soft parts by delivering with them in that position. If the operator has no straight instrument this will be necessary, unless he brings the face out under the symphysis pubis, by performing rotation in the opposite direction. With the curved forceps it is quite a justifiable procedure, if we must use this instrument; but the straight forceps is the right instrument for this operation

APPLICATION OF THE FORCEPS WHEN THE OCCIPUT IS TO THE RIGHT GROIN.

The blades are introduced in a manner very similar to the procedure in the first position, only the left-hand blade is inserted more anterior than in first position of the vertex. When rotation is effected, the occiput moves from right to left instead of the opposite direction, and the delivery in this case is precisely the same, with the exception of the manner of rotating.

APPLICATION WHEN THE OCCIPUT IS TO THE LEFT SACRO-ILIAC JUNCTION

Is the same as in the condition last described, and, after locking and securing the instrument, rotation should be effected around the left side of the pelvis to pubis, as directed in describing the operation when the head lies with the occiput to the right sacro-iliac junction, except in the opposite direction. Although the description above given of the manner of using the forceps is generally applicable, we sometimes find it impracticable, especially if the head is impacted closely, or the pelvis misshapen, to apply the curved instrument to the side of the head when diagonally placed in the pelvis. In such instances we are justified in introducing the curved forceps, with one blade on each side of the pelvis, seizing the head diagonally. The great difficulty in this operation is in adapting the blades so that they will lock without force. This may usually be done, however, by placing the blades opposite each other as perfectly as possible, and then pressing both together far back toward the coccyx, pushing the perinæum back with them. In most cases this manœuvre will cause the upper part to fall easily into the lock on the lower, and they are adjusted.

APPLICATION OF THE FORCEPS AT THE BRIM, OR ABOVE THE SUPERIOR STRAIT.

The long curved instrument is the only one adapted to this operation. It is difficult and sometimes almost impossible to determine the exact mode of presentation in this high position of the head, and if we could thus determine exactly the situation of the presentation we could not apply the blades to the side of the head, if diagonally situated, on account of the curve in the blade of the instrument. Hence most all authors agree in directing the forceps to be used in such cases with reference to the sides of the pelvis instead of the position of the head. The position of the patient for the use of the long forceps at the superior strait is the same as for an operation in the pelvic cavity. The fingers, and, if need be, most of the right hand, may be passed up along the head, to be sure of guarding against injury to the os uteri, and to guide the blade of the instrument clear of any obstruction. The left-hand blade is to be carefully introduced, and carried up, in accordance with the curves of the pelvis, between the right hand and the head, until the blade is within the uterus, and well adapted to the convexity of the fœtal cranium. The handle of this blade should be pressed somewhat back upon the perinæum, and held by an assistant as before directed. The other blade should be introduced on the opposite side, very carefully, until it assumes a position on the other side of the head corresponding to the first, and the lock portion placed in proper apposition to its fellow. They will generally pretty easily become locked; but if difficulty arises it will depend upon want of correspondence in position, or in the points of the blades being too far backward. We should, therefore, carefully adjust them with reference to each other, and then press the handles as far back as practicable with the integrity of the soft parts. The lock will scarcely fail to receive adjustment with this kind of management. In locking the forceps the operator must be watchful to avoid including any of the parts of the external organs, or the hair upon them, as this would give the patient much unnecessary pain. The fact of the head not having been pressed down into the pelvis by the efforts of the uterus, indicates serious discrepancy in the diameters of head and pelvis, and prepares us to expect much difficulty in the delivery; yet as this state of things leaves no alternative but embryotomy, which is certain destruction to the fœtus, we must make every reasonable exertion to avoid it. After the forceps is applied we may place our hands on them as before directed, and make traction in the direction of the superior strait —downward and backward. The effort at first should be traction merely, and if this fail to cause the head to descend, we may exert some pressure by squeezing the handles closer together. This last should not be resorted to, however, until after a continued effort at traction satisfies us of its inadequacy. The pressure and traction should both be intermittent, and correspond in time with the uterine contractions and intervals, which might be regarded as similar to their times of recurrence. The pressure may be quite decided if necessary, in fact as much as is required to mould the head into the proper shape and size—provided always we are sure that it is necessary. If we succeed in bringing the head down to the external parts, we will find that one blade of the instrument is over one side of the occiput and the other over one of the frontal protuberances, or diagonally applied. The question now comes up as to the propriety of rotating the head, or drawing it through in that position, or of removing the forceps and reapplying to the sides of the head, or of using a pair of straight forceps for the latter purpose. I am strongly inclined to favor the latter proceeding, because there is no harm usually in delaying for a short time at this juncture, and there is less danger in removing the long and applying the short, or straight-bladed instrument, than in drawing the head diagonally through the vulva. Dr. Ramsbotham, however, favors the plan of finishing the delivery without removing the long forceps or making rotation. As will be understood, I advocate using only so much force and pressure as are *necessary* to deliver the head; but I believe we may sometimes deliver a living child under great pressure, and with the use of much force, by means of the long forceps, that must otherwise be sacrificed to embryotomy, and would therefore urge the practitioner to essay the long forceps in all doubtful cases. If we fail we can then feel that our extremity is demonstrated, and the less reluctantly resort to desperate measures.

The forceps may be used in face presentations when anything arises during labor to require interference, as exhaustion, impaction, etc. With the chin toward either groin the application is not difficult, and is very similar to the operation in occipital presentations in this position. The blades should be applied to opposite sides of the head. Traction must be made until the chin descends to a point corresponding to the arch of the symphysis, and then this part should be gently rotated to the front, and as the parts are expelled we must keep the chin close to the symphysis until the occiput rides over the perinæum and escapes from the vulva. If the chin is situated posteriorly in the pelvis after the instrument is applied, rotation forward should be effected in a gradual manner as the head descends, until the chin shall be applied to the symphysis and the occiput escape behind.

Application of the forceps in breech or footling cases.—It sometimes happens that in labor commencing with breech presentation we experience great difficulty in getting the head to pass through the pelvis. The head is detained long enough to compress the umbilical cord fatally. If we have the forceps at hand the head may be quite readily extricated, and the life of the child thus saved. Dr. Meigs thinks the practitioner not justified in attending these cases without having this instrument with him, ready for such emergencies. When this kind of arrest is met with, an assistant will hold the expelled portion of the fœtus in such a position as to be least in the way of the introduction of the instrument, while the operator successively introduces the blades of the forceps, the first on the left and the second on the right hand side of the pelvis, locks, and makes extraction with as much expedition as is compatible with safety to both the mother and child. It will generally be found, when using the straight forceps, with the occiput at the symphysis, that they will be more easily applied if the body of the child is raised up sufficiently to introduce the instrument below it. The curved instrument, however, can be used by passing it over the child, as it is held in a more dependent position between the thighs of the patient.

To review the steps of forceps operations, we will find that the damage likely to result to the child is sometimes very serious, and should have our earnest attention. The one most to be dreaded is caused by too powerful and long-continued pressure in operating at the superior strait. Irreparable violence is done to the brain in certain cases. Effusion of blood in the structures, and great and fatal congestion of it are the not uncommon effects of incautious and unnecessary pressure. This may, in many instances, be avoided by a complete intermission of pressure between pains. The fœtal head will bear very great pressure if it is applied slowly, so as to give the structures time to accommodate themselves to the changes caused by it. We should consequently be deliberate and slow in applying force, both for purposes of extraction and compression, and not expect to use enough of either to effect delivery with rapidity; and in the absence of pains allow the forceps to expand, and if they do not do this, we should loosen the handles all the time during the interval, in order to allow as great freedom in the circulation as possible; and when the pain does begin, and we desire to resume the traction, apply it slowly, instead of bringing the instrument to its bearings on the head with a sudden motion; and when we relax our effort, it ought to be in the same gradual manner. We cannot always so adjust the forceps in the upper portion of the pelvis as to avoid pressure upon the soft parts about the face, and one of the risks in using the forceps in a diagonal position is injury to the cheek, eye, or scalp. These parts should be examined after deliveries of this kind, and such dressing applied as will repair the damage and prevent mutilation. In one instance in my own practice I had the misfortune to lose a patient from hemorrhage resulting from a wound in the scalp near the frontal protuberance. Although I had dressed the place with adhesive plaster, approximating the edges of the wound, and for an hour there was no bleeding, in my absence, and in three or four hours from the time of delivery, it bled so profusely as to exhaust the child. I do not know how to account for this, unless upon the grounds that there was hemorrhagic diathesis, and that the bleeding did not occur at first because the capillaries had been pressed so strongly as to partially obliterate their cavity, and that it came on afterwards on account of their distention so soon as the vigorous action of the heart had expanded or ruptured their lacerated walls.

The mother sometimes sustains very decided damage from the forceps by too much hurry in extraction, or for want of proper direction in traction. We should remember that there is pressure on the soft parts in the pelvis, and that the pressure is between two bony substances, and that our instrument is steel. Slowness and gentleness, so far as they are compatible with the necessities of the case, should be observed. The parts will dilate under slow and gentle pressure which would be torn by incautious haste; and intermittent pressure, when great, will often do much less damage than steady and constant, and of less degree. Pressure of the vagina, bladder, and rectum by the descending head may give rise to severe subsequent inflammation if continued for a long time with violence; but if we give time between pains for the re-establishment of the circulation, and some nutritional changes that must be arrested by great pressure, often these damages may be prevented. Time is especially important, when the head is passing the external parts, to permit of the dilatation necessary to avoid laceration. This can be insisted upon with more propriety now, because our patient need not suffer the agony at such times as when anæsthetics were not administered. Another precaution at this time is to be careful of the points of the blades, as extension is made around the pubis. They may project beyond the head and be brought in rough contact with the perinæum, contusing, and even sometimes lacerating it very much. I have seen at least once a rupture of the perinæum, from the fourchette through the sphincter into the rectum, from an expansion of the blades in slipping over the head. The temper of the instrument was not good, or else the blades were too tight; at any rate, the points were dragged over the parietal protuberance, and the enormous distention thus caused the laceration. The precaution taught by Prof. Meigs, to keep the index finger on the head during traction, to watch the relation of the instrument and head, will enable us to avoid such accident.

Obstetric Extractor.—This is an admirable instrument for mere extraction. It is the invention of Dr. John Evans, former Professor of Obstetrics in Rush Medical College of this city. I think I should be justified in saying that it was more nearly a perfected form of fillet than anything else. The metallic portion consists of parallel branches of the best tempered steel, highly polished. They are five-eighths of an inch wide, one-twelfth of an inch thick, and fourteen inches long. One half the length of these flat steel bars is straight, while the other half is curved to fit the hollow of the sacrum. There is a joint one inch and a half from the end of the concave portion of the branches, that permits of some motion. This joint motion does not permit the extremity to be bent more than an angle of twenty-five degrees from the

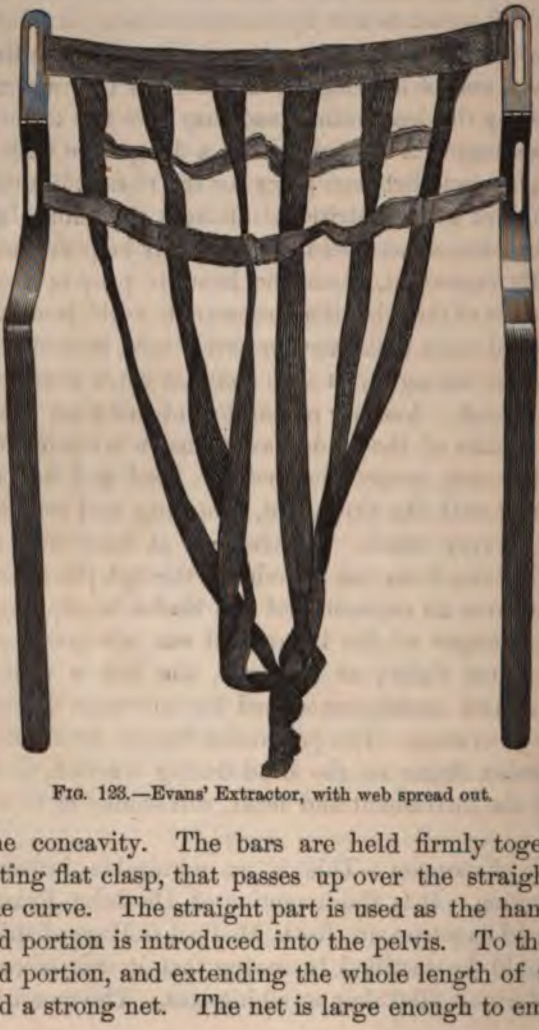


FIG. 123.—Evans' Extractor, with web spread out.

line of the concavity. The bars are held firmly together by a closely fitting flat clasp, that passes up over the straight portion toward the curve. The straight part is used as the handle, while the curved portion is introduced into the pelvis. To the edges of the curved portion, and extending the whole length of the curve, is attached a strong net. The net is large enough to embrace the head of the fœtus. It is made of silk tape and cord,—one strong silk tape at the extremities, and several others along at different points, hold the bars together and permit them to be separated far enough to wrap around the head of the fœtus. Several pieces of tape extend, at equal distance from each other, parallel with the bars, and are as long as the bars themselves, or about fourteen inches long. When the net is extended its full length and breadth, it measures seven inches long, ten inches across the end of the curved portion, and thirteen inches at the extremity next the straight part. It can be used however only in cases where there is no impaction of the head. When we wish to introduce the instrument, the branches are fastened together, with the net behind the convex side of the curved portion of them. As before stated, the steel branches are fastened together by the sliding clasp. It should be well lubricated with oil or lard, so that the net cannot cause friction on the vaginal membrane. The fingers of the left hand are inserted into the vagina, in the hollow of the sacrum, as far as they can reach, and the instrument is inserted between them and the head, with the concave portion of the branches closely applied to the cranium. The branches should be made to take the direction of the hollow of the sacrum, and pushed upward until the ends have passed the head. The clasp should be removed from the branches, so that they can be separated. One branch must be held firmly in its place by an assistant, while the operator, with the fingers introduced upon the branches, should cause the other to sweep around the whole circle of the pelvis to the opposite side of its fellow. The net will thus be cast around the head. The condition and relation of the

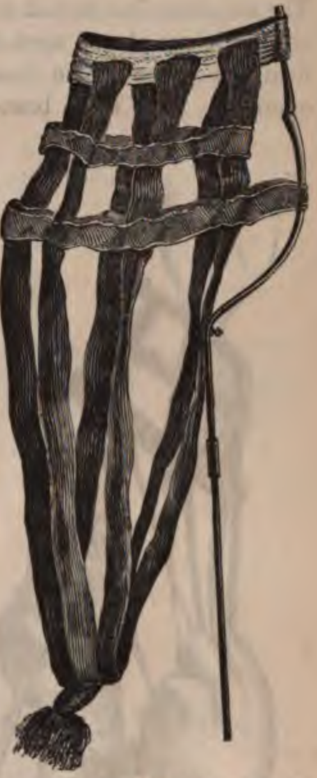


FIG. 124.—Evans' Extractor, with the web closed, as when applied to the head.

whole instrument, with reference to the fœtus and its several parts, should be carefully examined, to assure ourselves that the head is entirely embraced by the net. If it is not quite high enough, the branches should be pushed up, one at a time or both together, and the net placed accurately over the whole head. This is not a difficult matter, and the net will generally be well adapted as soon as the moving branch has been carried entirely around it. The two branches should next be perfectly adjusted to each other, and the clasp placed upon them so as to hold them in perfect and firm apposition. The instrument, thus placed, is ready to be operated. The steel branches are in the hollow of the sacrum, while the net corresponds to all the remainder of the pelvis. The long tapes of the net hang out of the vagina, anterior to the branches, and when their ends are tied together give us a firm hold, and it is through them that the main extracting force is exerted. Pulling upon them, and then upon the steel branches, the head is caused to descend, and by alternating our traction before and behind we will make progress with as much certainty and celerity as with the forceps. As the head emerges the branches are raised, in order to give it the turn up under the symphysis pubis. The extractor is as easily applied as the forceps, is applicable to the same conditions, except where compression is necessary, and may be used without reference to position of the vertex. There is hardly any danger of injuring the child's head with it; it is incapable of rupturing the perinæum, or doing other damage to the maternal organs without great ignorance or carelessness, and permits the rotation of the head by the natural shape of the pelvis and soft parts, the same as it would occur without the instrument.

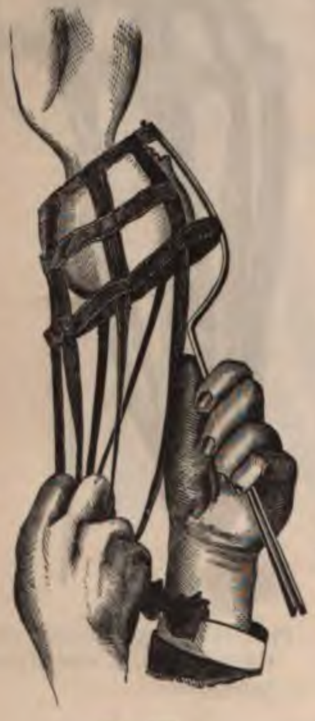


FIG. 125.

The entire safety of the instrument, and yet its great efficiency, I am persuaded would commend it to the profession, if it was used sufficiently to gain a habit of using it.

THE FILLET

Has fallen into disuse because of the difficulty of applying it in most cases, and the great superiority of the forceps. It may be used, however, to some advantage in difficult breech presentation. Passed over the flexure of the thigh, it is a very desirable addition to our means of extraction, but is seldom used in this case, because the fingers are far handier and more efficient.

THE VECTIS OR LEVER

Is an old instrument, very seldom employed, but is certainly useful in changing certain malpositions of the head. It is in shape very like one blade of the straight forceps, except that the curve is greater near the end. The German obstetricians call it a spoon. A good deal of dispute has arisen as to whether it should be used as a vectis, to draw the head down one side at a time, or a lever, to pry the head down; but for the purposes of extraction it is so much inferior to the forceps and extractor that the instances will be very rare in which it would be substituted for either. In face presentations it may be used to change the face into a vertex

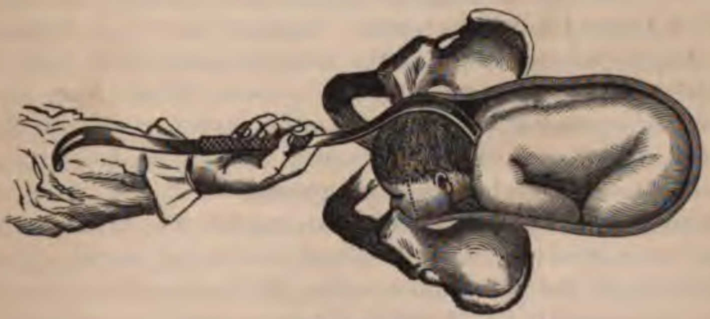


FIG. 126.

presentation, or to bring down the top of the head in cases where one side of the head presents. It would be equally applicable to cases of brow presentations, and in such instances would enable us to bring down the occiput.

THE VECTIS IN RETENTION OF THE HEAD AFTER THE DELIVERY OF THE BODY

Is sometimes more easily used and more effective than the forceps, and is recommended by Dr. Coppée as a very efficient means of quickly terminating these cases. The woman should be placed in the same position as for the use of the forceps. "If the occiput be directed transversely or in front, the vectis should be slipped behind the symphysis, and applied either upon it or upon the mastoid region. But when the forehead looks toward the anterior arch of the pelvis there is danger of wounding the face, and the temple is then the part to be acted on, remembering that the further the instrument is inserted the less will the face be exposed to injury. The head, under these circumstances, has a position the reverse of that which it has in vertex presentations, so that when the vectis passes rather deeply it goes beyond the face and applies itself either upon the forehead or upon the sinciput. Here the natural labor is to be imitated, and the forehead sometimes to be pressed backward so as to roll it into the hollow of the sacrum, and sometimes to be brought directly down under the arch of the pubis. The state of flexion or extension of the head will indicate which course it is best to pursue. In cases where it is necessary to drag for a long time with the hand, the least effort with the vectis will suffice to extract the head; and in difficult cases on account of contracted pelvis, the use of the instrument is most effectual." It is hence the best instrument to bring the head through in cases where turning has been resorted to on account of contracted pelvis. "When the head has reached the inferior strait, and more especially when the head is arrested merely by the resistance of the perinæum or vulva, the hand ought to be sufficient to extract it, but if not, the forceps should be preferred to the vectis."

Dr. Simpson suggested an instrument called the pneumatic tractor, to be applied by a suction pump to exhaust the air from it and make it fit closely to the head. I believe, however, that it has not been used to any extent by the inventor or anybody else, and is now only mentioned by most writers on obstetrics.

EMBRYOTOMY.

The simplest signification of this term is cutting the fœtus; and it is applied to almost, if not all, kinds of mutilation practised upon the fœtus for its removal from the uterus at full term. It is a very old method of delivery, and perhaps the first ever practised. By embryotomy the child is lessened in size sufficiently to enable us to extract it when it could not otherwise be removed. The cavities are opened, their contents evacuated, and they are crushed in and flattened, or the bones constituting their walls removed, so that the least possible space is occupied in passing through the pelvis. Perforating and evacuating the head is called craniotomy, and practised very much more frequently than all other forms of embryotomy; for being the largest part of the fœtus, as well as the most unyielding, in a great majority of the cases where this operation is called for it is only necessary to reduce the head to extract the remainder without difficulty. When the thoracic or abdominal cavity is operated upon, the term evisceration is generally used to signify the operation, or sometimes embryulcia is applied to these operations. When the obstruction is so great that we are obliged to cut and remove the fœtus piecemeal, the term embryulcia, or the general term embryotomy, may be used to express the object attained. There is no other condition upon which the surgeon attends in which he is called upon to be the arbiter of life, and execute a judgment that sacrifices a human being for any purpose. Here the life of the fœtus is literally placed in his hands to be disposed of, if he deem it necessary for the salvation of the mother. It is not strange that conscientious practitioners sometimes shrink from the responsibility of solving a problem that seems providential in its origin. Viewed in the light of the term homicide, the responsibility becomes a fearful one indeed, and is not justifiable except when it seems to be the only means left us to save the life of the woman. One observation that will comfort us in this dire necessity is, that unaided nature will always sacrifice the child, and in a great many instances the woman also, so that when it is an indispensable proceeding, the life of the child is of almost no value, while that of the mother will be sacrificed only in consequence of the difficulties arising from its presence, and may be saved with a good deal of certainty. It is in this consideration we found the strongest argument in favor of embryotomy. When, therefore, we meet with a case of labor that, in view of all the circumstances, nature is certainly incapable of terminating in safety to the mother and child both, and that we cannot terminate by the use of the forceps, or instruments belonging to that class, we may consider embryotomy justifiable. It is possible, in the almost infinite variety of circumstances transpiring around us, to find exceptions to this rule, and in such cases we resort to gastrotomy. I will consider these circumstances when that operation is disposed of. In deciding the propriety of embryotomy in any particular case, we should weigh life against life, and not the life of the fœtus against the convenience or the necessity of mutilation of the mother merely. If it is pretty certainly within our power to save the life of both by merely mutilating the woman, we should take the risk of the latter rather than deprive the child of life beyond all possibility. I shall be more specific in a subsequent page upon this subject. One of the most common conditions we meet with requiring embryotomy is contracted pelvis, or pelvis in which the cavity is obstructed by osseous or other sorts of hard tumors—cartilaginous, glandular, or fibroid—outside the vaginal cavity. When the pelvic canal is reduced, from any of these conditions, to a size below three inches in the antero-posterior diameter, an average-sized fœtal head will not pass without mutilation or fatal compression; hence, if the measurement is not below two inches in diameter—and some authors say one and three-quarter inch—embryotomy is a justifiable operation, and demanded as the only condition of safety to the mother. It should be remembered, in determining the question in any given case, that there are cases in which the head of the child is below the average size, and they form exceptions to this rule. We are unfortunately unable to measure the fœtal head inside the woman, and we cannot arrive at correct conclusions as to this point in any other way than by giving time to the natural efforts to intrude the head into and pass it through the pelvis, or make a trial of the long forceps. We should, therefore, when there is any doubt in our minds as to the possibility of delivery without embryotomy, resort to forceps or turning, with the hope of saving the life of the child. These failing, our only course is demonstrated beyond cavil.

The head itself is sometimes the subject of difficulty when the pelvis is normal in size and unobstructed,—the hydrocephalic, too large but well-proportioned head, or a tumor on the head. I have already shown how this source of difficulty operates in rendering labor impracticable. As I have already said, we cannot measure the size of the head with any accuracy while in the body of the mother; but after nature fails we may, in cases of doubt, try the innocent class of instruments, and, failing with them, resort to craniotomy. Enlarged thoracic or abdominal cavities, and impracticable cases of monsters, are other conditions requiring this operation.

In shoulder presentations, when we can assure ourselves that the fœtus is dead, we ought not to think of any other operation, as it is far less hazardous to the woman than turning. Also in breech or feet presentations, or in cases of turning when it is impossible to bring the head through either with or without the forceps. There is scarcely any condition of the soft parts that will justify us in resorting to embryotomy. Cicatrices may be divided or torn, rigid os uteri, vagina, or perinæum, cut, stretched, or even lacerated, before the life of the fœtus should be sacrificed. Dr. Barnes' dilators, which I shall have occasion to describe after a while, will aid us in this class of cases very decidedly. The damage done to the soft parts for the removal of the fœtus, will, many of them, undergo spontaneous cure, while the balance are susceptible of surgical relief, if not entire reparation. In Great Britain this operation is performed more frequently than in any other country—once in about 210 cases; while in Germany about once in 1900 cases of delivery is shown to be the practice. In France about once in 1200 labors. I am not aware that there are statistics showing the proportionate frequency with which it is resorted to in this country; but as our midwifery practice more nearly resembles the British than that of the continent, there can be but little difference in this respect. Embryotomy is attended with quite a high mortality, as shown by the statistics of the operation, as the mother is lost in the proportion of one case to every five. In addition to this mortality, great injury may be done to the soft parts by bruising, and sometimes by lacerations.

Craniotomy, as before remarked, is the most frequently necessary. The particular instruments used for this operation, in this country especially, are the perforator, the crotchet, or sharp hook, and craniotomy forceps. The perforator is made differently, according to the fancy of the inventor, but it is always made with a sharp point, almost always with two blades, that increase the opening by being separated. Smellie's scissors perforator, as represented in Fig. 127, is the one I use and prefer. It is about twelve inches long, shaped like scissors; the points of the blades are sharp, and the outside parts furnished with cutting edges that terminate at a shoulder, to prevent the instrument from passing further. The insides of the blades are also furnished with sharp edges like scissors, to enable us to use them in cutting. The crotchet is about a foot long, nearly straight, until within about two inches of the end, where it is slightly curved; at the end it is bent abruptly into a hook. The point of this bent portion is made moderately sharp, so as to fasten upon bone, without being keen enough to readily cut through. The craniotomy forceps are also used for extraction. It should be light, and furnished with teeth or roughened surface on the inside of the jaws of the instrument, to furnish a good hold, and the whole strong enough to enable us to apply decided force. To these is added, for some forms of embryotomy, the blunt hook, with a much larger curve, for the purpose of encircling the limbs, or fastening—without tearing—upon any part upon which they impinge.

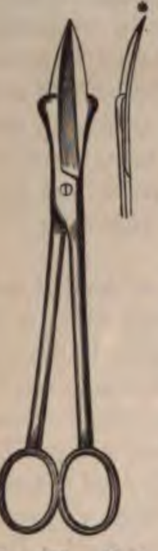


FIG. 127. — Perforator.

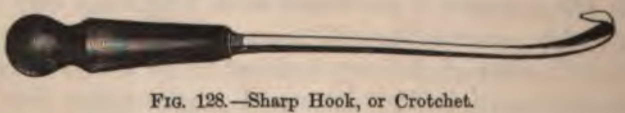


FIG. 128.—Sharp Hook, or Crotchet.

Perforation is performed in the following manner, viz.:—Introduce three fingers of the left hand and place them upon the most prominent and dependent portion of the cranium, and plant them firmly against it; take the perforator by the handles in the right hand, and place the cutting part of it in the palm of the left hand, and push it up along the palmar surface of the finger until the point comes in contact with the head. In doing this part of the operation the point of the instrument is kept in close contact with the hand and fingers, and as it enters the parts the sharp edges should be guarded by placing the index and ring fingers a little in advance of the middle, so that the point and edges may be constantly in contact with the fingers. This should be the position of the fingers and instrument during the whole time the perforator is in the vagina. When the point of the instrument is pressed against the skull, the outside part of it should be directed backward against the perinæum, in order to make it assume a perpendicular relation to the surface of the skull at the part attacked. In this position the point must be pressed into the cranium up to the shoulder. A boring motion will very greatly facilitate the entrance. With the fingers still guarding the instrument, the handles must be separated about three inches by the thumb and fingers of the right hand, or by means of an assistant holding one handle by the ring, while the operator separates them by action upon the other. This being done, the cutting edges may be drawn out of the cranium, and the point entered at the centre of the first incision, in a transverse direction to it, and pressed into the shoulders again, and again separated as before. We now have a crucial perforation into the cavity of the cranium. Through this we pass the perforator until the point of it touches the bottom of the cavity opposite to the place of entrance. The perforator may be withdrawn half an inch, and then made to sweep the whole cavity of the cranium from side to side, crosswise, diagonally, and, in fact, in every direction, until we are satisfied that all the processes of the dura mater have been

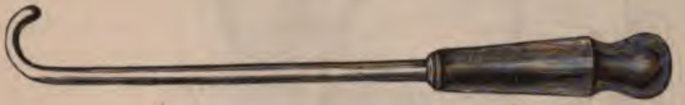


FIG. 129.—Blunt Hook.

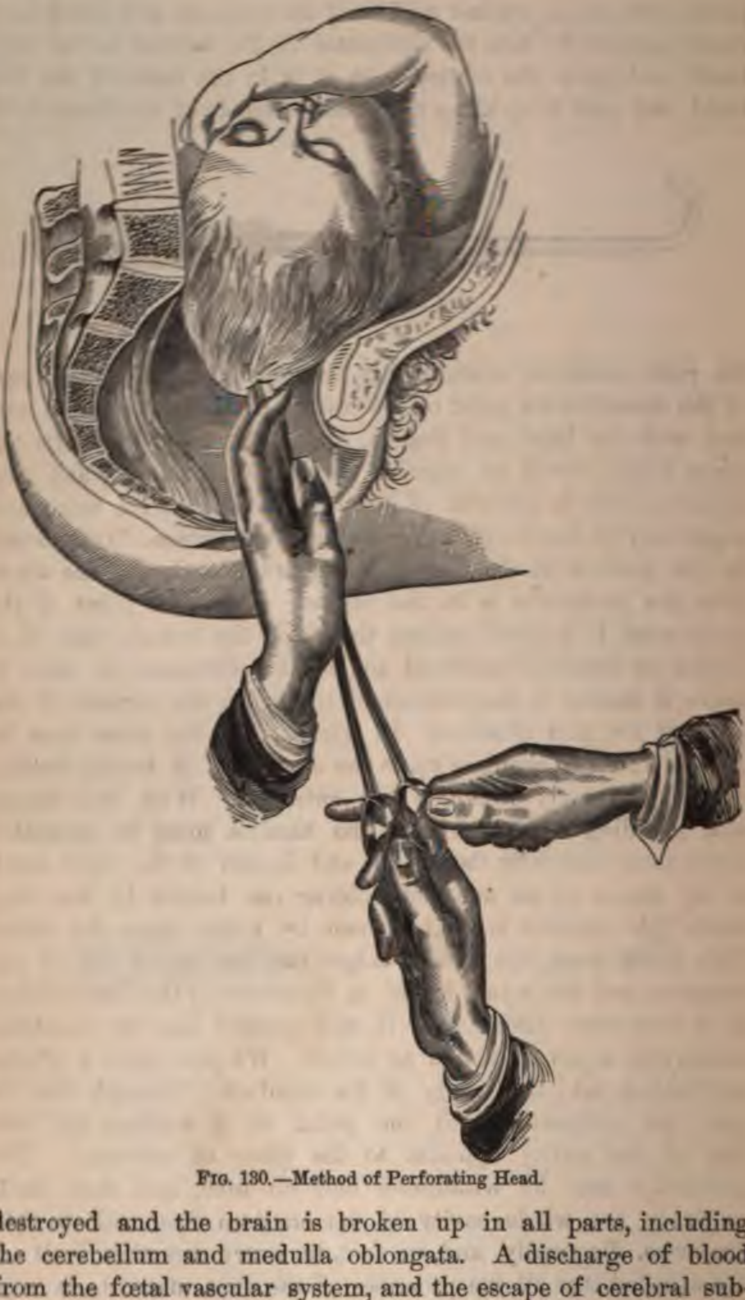


FIG. 130.—Method of Perforating Head.

destroyed and the brain is broken up in all parts, including the cerebellum and medulla oblongata. A discharge of blood from the fœtal vascular system, and the escape of cerebral substance, indicate the completion of this part of the operation. If the pains are strong and frequent, and the disparity between the size of the head and pelvis not too great, this will be all that is necessary; the pressure upon the sides of the cranium will cause it to collapse, the brain to be expelled, the head to descend, and labor terminated, and it is best always to wait from fifteen to

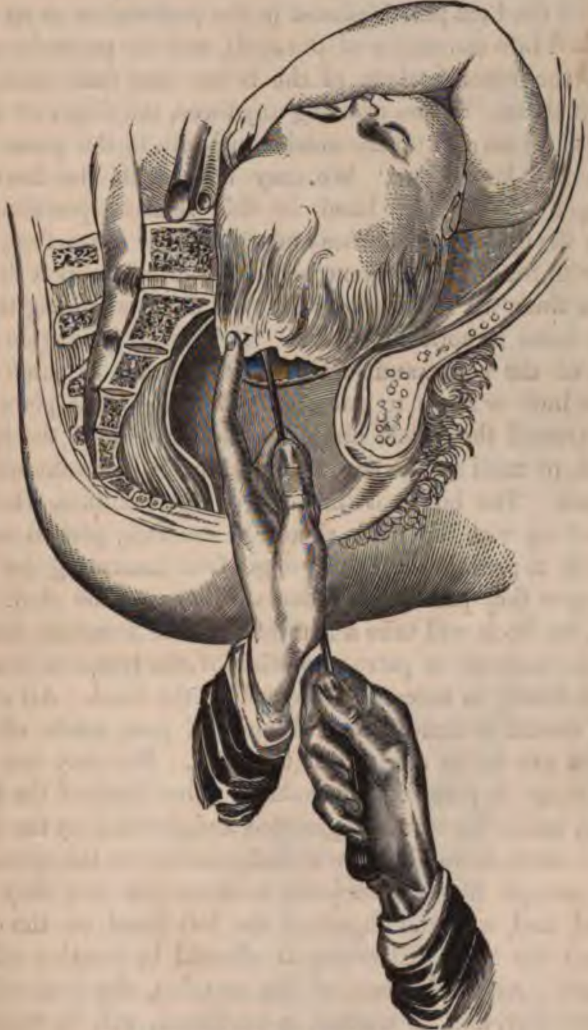


FIG. 131.—Mode of using the sharp Hook.

thirty minutes to see what the effects of uterine effort will be. If there is no advance, or if it is slow, or there is any other reason for despatch, we may at once proceed to extract the fœtus. The crotchet is introduced along the left hand and fingers, in the same manner as the perforator, until it arrives at the perforation. The knuckle of the bent part is placed in the perforation at its centre, and pushed into the cavity of the skull, and the point brought to bear on the inner surface of the bones near their base, if we can get it there. Before exerting any force, the finger of the left hand must be carried up the outside opposite to the point of the crotchet and kept there. We may now, with the instrument and finger of the left hand in this relative position, press the hook firmly into the bones and commence extraction, aiding in this with the fingers. Generally, after pulling upon the hook for some time, we will discover that the point is passing through, and the bone is split or broken. This is an indication for the removal of the point, and changing its position to some firmer place, an inch or more to one side. We may thus plant it and extract around the whole circle of the skull until the head is extracted, or until all the cranial structure is comminuted down to its base. The bones of the vault of the cranium, when thus splintered up with the hook, should be carefully picked out with the fingers, to prevent their sharp edges from lacerating the vagina and vulva as they pass out. When the base of the skull is thus reached, the hook will take a firm hold in the foramen magnum, or on the mastoid or petrous portion of the temporal bone, and enable us finally to succeed in extracting the head. All our perforation should be done in the absence of pain, while efforts at extraction are to be made with the pain. We may use craniotomy forceps in place of the crotchet. One blade of the forceps is pushed inside the cranium, guarded and directed by the fingers, while the other, more closely watched, passes over the outside, and soon as enough tissue is enclosed between the two they are to be closed, and, with the fingers of the left hand on the outside blade and the skull, extraction is effected by traction with the right hand. As in the case of the crotchet, the bone will generally give way, and, if traction is continued, will be withdrawn with the instrument. The bony fragment ought to be carefully guarded as it passes through the vagina, to prevent wounding it. The forceps is again introduced, and fixed upon some more solid part, and extraction continued until we succeed in getting the head out.

Dr. Simpson, the ingenious inventor of surgical and obstetrical appliances, has given us an excellent instrument for extracting the head after perforation. He calls it the cranioclast. The cranioclast resembles the craniotomy forceps, only it is larger and heavier, and has no teeth. It has an outside and inside blade. The outside blade is longer, and has a concave surface deeply serrated, and it is fenestrated. The inside blade is convex, and serrated on the side next its fellow, and not much larger than the fenestrum in the outside blade, into which it fits somewhat closely. The two blades are joined together with a lock, like ordinary forceps. After perforation has been effected the inside blade is passed through the perforation to the bottom of the skull, and held in that position until the outside is passed over the outside of the skull, opposite to the inside blade, and the two approximated and locked. When thus locked the blades embrace a section of the cranium from the perforation to its base. Short movements are made with the instrument, twisting and oscillating until the bone enclosed in the bite of the instrument is fractured at the base of the skull and the sides, in fact all around the instrument. The blades are loosened and passed around one-eighth or a quarter of the cranial circle, closed, and that part fractured in a similar way to the other. This is to be repeated until the cranium is comminuted in the whole of its vaults and base, for the instrument used in

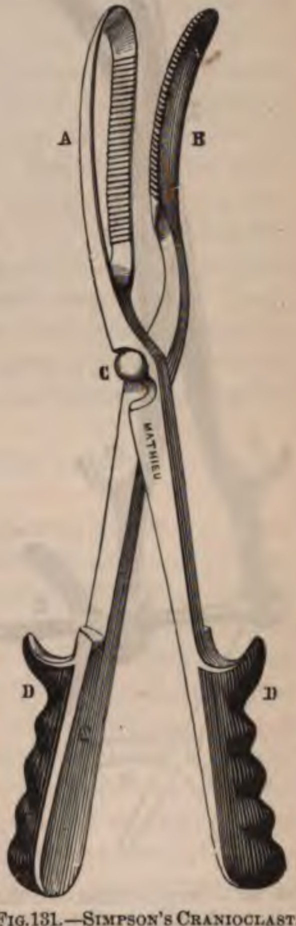


FIG. 131.—SIMPSON'S CRANIOCLAST. —A. Outside, B. Inside blade. C. The joint. D. and D. Handles.

this manner fractures the resisting basilar, mastoid, and petrous portions of bone, and thus does away with the most resistant part of the whole head. The head thus operated upon is reduced to a soft compressible mass throughout, while the scalp is not injured save where the small blade enters the perforation. The integrity of the scalp insures the vagina from damage by spicula of the bones as the head passes out. If there are pains, they will very easily press the brain out, and cause the soft comminuted head to collapse and expel it. In addition to this admirable effect exerted by the cranioclast on the head, it is one of the best, if not the best instrument with which to extract the head, as the blades may be made to include so large a part of the skull as to make an effective means for extraction. The grasp is as firm as the craniotomy forceps, includes a much larger quantity of the head, and does not tear out so easily. Another and more summary method of removing the head is to crush it *en masse* with the cephalotribe. This instrument seems to have originated with Baudelocque the elder. His instrument was intended to crush the head and extract it, and is a formidable as well as awkward one compared to those of the present day, and while it most effectually did the first part of its

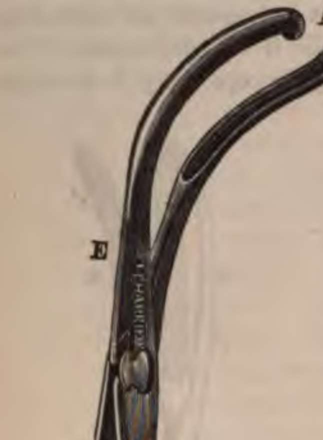


FIG. 132.—CEPHALOTRIBE.—A. Extremities of the blades. B. Shoulder upon which to make traction. C. Nut and screw with which to make compression.

work, it often failed to extract the head. The one I use was made in Berlin, and is a modification made for Dr. Martin of the University at that place. It consists essentially of a strong forceps with a hook-like termination of the blades, that sinks into the skull at its base, and thus takes a firm hold for extraction. At the extremity of the handles is a screw rod reaching from one handle to the other, with which the handles are made to approximate each other with irresistible force. The blades are locked together like ordinary forceps. The left-hand blade is introduced on the left side of the pelvis, as the midwifery forceps, observing all the precautions necessary with those, and is held by an assistant; the right-hand blade is placed on the opposite side of the head, and the instrument locked. The rod with the screw and nut is fixed in the handles, and the process of crushing commenced by working the nut on the screw. As the blades approximate each other the skull is crushed together, the brain expelled through the perforation, and the head made to assume an elongated, flattened shape. The compression should be preceded by perforation, and must be accomplished between pains. After the compression is completed extraction is commenced, and conducted during pains.

The contraction must be very great if the cephalotribe does not easily remove the head.

Craniotomy becomes necessary after the body has been expelled in footling, breech, or knee cases, or after turning has been accomplished. The head is too large to pass and it must be lessened and withdrawn. We may introduce the perforator at the mastoid process, or near it, break up the brain, plant our crotchet, or, what is better, the blunt hook on the bottom of the skull, and apply extractive force sufficient to bring it away. The operation is generally easily accomplished, and I have sometimes succeeded by the use of the crotchet without the perforator, pressing the point of the crotchet deep into the skull, over the mastoid process. Craniotomy, in cases where the head has been torn or cut from the body, may become necessary also. The head may be turned over until the anterior fontanelle can be felt, and then, while being steadied by an assistant at the top of the pelvis, it can be perforated and extracted. I once removed the head by fixing it with a hook passed into the foramen magnum, until it was perforated behind the ear, and the brain, to some extent, removed after being broken up. Traction with the hook, in the foramen magnum, finished the process.

In arm presentation, if the fœtus is dead, the hand should not be carried up into the uterus for version, but evisceration ought always to be practised, because attended with the least danger and pain to the woman. The method I adopt in such cases is to draw the presenting part as low down toward the perinæum as possible, and perforate the side presenting as far toward the hip as possible; if in the thorax, between the ribs, making a free opening. Through the opening the sharp hook is carried down the abdomen to the ileum, the left hand extending along outside, to guard and govern the movements of the instrument inside. The instrument, once fixed

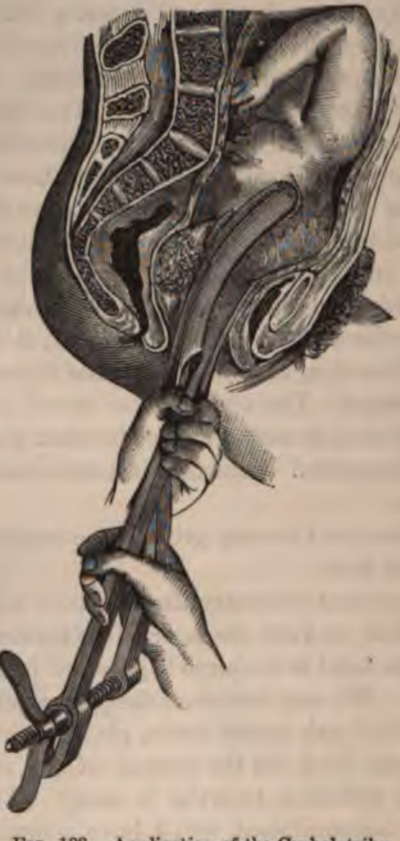


FIG. 133.—Application of the Cephalotribe.

in the bones of the pelvis, traction is made downward and toward the opposite side of the pelvis. In this way the breech is readily brought down and version easily accomplished. If we cannot reach the hip, the hook should be planted upon the vertebra of the spinal column, as near to it as possible, with the same object. If we desire to lessen the size of the fœtus, we can extract the heart, lungs, liver, and alimentary canal with the crotchet, after perforation is accomplished, and fix it on some part of the spine, break it, and cause the fœtus to double up, and come away in this manner. In very few instances, however, will we fail to cause version to take place by the former method. If the abdomen is too large, it may be evacuated by the perforator and hook, as may also the thorax, in the manner above described.

When contraction in the pelvis is very great, the fœtus cannot be removed by simply evacuating the cavities and traction, but it will be necessary to pick it to pieces with the crotchet and embryotomy forceps, aided by the perforator, and any other form of instrument that may become available and is within our reach. If the difficulty is very great we may await the effects of decomposition. Twenty-four or forty-eight hours' delay, after the fœtus has been very much mutilated by instruments, in the warmth and heat of the uterus, will lessen the resistance of its soft parts and enable us to enucleate the bones from their attachments and remove them when impossible without.

Decapitation is very rarely practised now, and is, to say the least, an inexpedient and awkward operation, as the head requires to be removed separately after the body has been drawn out before it. A knife resembling in shape the blunt hook, with an edge in the concavity, is suggested by Dr. Ramsbotham. After having drawn the neck down by a blunt hook, the cutting hook is thrown over it, and a sawing motion made by vibrating the handle until it is caused to divide the parts. Of course the fingers of the left hand should be used to carefully guard the action of the knife. If we cannot procure this knife, a strong pair of straight scissors may be used for the purpose, having the neck held in position by the blunt hook in the hands of an assistant. Or, what is quite as expeditious and as handy, I think, is to attack the neck with the sharp hook and lacerate and cut through it with this. After decapitation, the arm, if not down, may be easily brought down, and traction made on it, aided, if necessary, by the blunt hook placed in the axilla, or the sharp hook inserted into the vertebræ or ribs. After the body has been drawn forth the head may be delivered, as I have directed above, when torn from the body by any cause. Dr. Barnes described a new method of performing embryotomy. He uses a steel wire écraseur, introducing the wire doubled, the bent portion held together until within the pelvis. When let go the wire opens out, and may be made to include a portion of the head. He works the wire through this part by means of the écraseur, and thus cuts off a slice of the cranium. This is removed by the craniotomy forceps, the wire reintroduced and another piece removed, and so on until the whole is taken away.

TURNING IN CONTRACTED PELVIS,

Although the recognized practice in the time of Denman, had fallen into disuse, until within the last few years the advocacy of it by Sir J. Y. Simpson, if it has not reinstated it as the common practice, has certainly established its expediency in some conditions. When the contraction is not so considerable as to preclude the hope that the head may be passed without destruction, and instead of the application of the long forceps with a view to compress the cranium enough to permit it to be drawn through, turning is an expedient of great value. And it is possible that occasionally the head may be delivered in this way, under circumstances that might require the use of destructive instruments without turning, especially if the vectis is used in the manner directed by Coppée to aid in its extraction. The reasoning on the subject is, that the bi-mastoid diameter is not so great by half an inch as the bi-parietal, and this part of the head can be made to enter the pelvis easier than the top, and that compression takes places as the effect of less power applied, so as to act toward the more yielding or upper portion of the skull, than toward the base or solid part of it. Against these considerations are the danger to the mother resulting from introducing the hand into the uterus for the purpose of turning, and the great hazard to the child from compression of the cord. This last is the more considerable, because of the increased length of time the head must necessarily be detained in the excavation. Dr. Simpson thinks this last risk may be very much decreased by selecting and placing the cord in the most roomy part of the pelvis, where the compression of it will be less complete. He also mentions, in favor of turning, the escape of the mother from the danger of laceration of the vagina and vulva from the use of instruments.

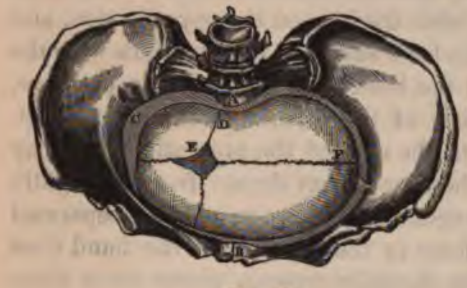


FIG. 134.

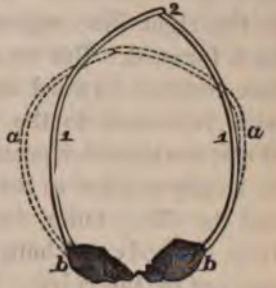


FIG. 135.

I think one of the best arguments in favor of this practice is that the head can be placed in such position as will adapt it to the irregularity of the shape of the pelvis, and that instruments as a consequence can be applied to it in the most advantageous relation; for it must be remembered by the student that much force exerted upon the neck by traction will be surely fatal to the fœtus.

LABOR RENDERED DIFFICULT BY PRETERNATURAL PRESENTATIONS.

The labors thus rendered difficult are called by Ramsbotham preternatural. Impracticable labor would probably be a better term, because this division includes those cases where the presentations of the fœtus are such that nature is incapable of terminating them favorably. When any part of the child presents at the superior strait but one of the ends of the body, it is impossible, under ordinary circumstances, for it to be expelled without a change is first effected in its position. All parts of fœti may, under different circumstances, be brought to the brim of the pelvis and crowded more or less into it. The most common is the shoulder, arm, or hand. When any one of these parts presents itself it is properly a shoulder presentation. Many exceptions occur in which the hand is found in the pelvis when the head is the main presenting part. Perhaps the next most common is the back, but the belly and sides may also be the presenting parts. The shoulders do not always present in the same manner. The most frequent method is the head in the left iliac region, hips in the right, with the back of the fœtus forward, or its face looking toward the back of the mother. It is, however, often found with the head in the right iliac region, with the hips on the opposite side, and back forward. But we also have shoulder presentations with the face looking forward and the head occupying similar positions, with reference to the parts of the mother, as in the two first. When the shoulder presents, the arm of the presenting side may be closely applied to the chest, or it may depart from it slightly and the elbow enter the vagina, or it may be entirely separated from the body and hang down in the pelvis, and the hand even pass out of the vulva. The shoulder presents about three times in a thousand cases. All the rest of the cross presentations are so rare that I have not found sufficient statistics to make an average possible. It would be entirely useless to the student to detail the multitude of speculations as to the cause or causes of malpresentation. They are more frequently observed in women with deformed pelves and in cases of premature labor. Probably the large amount of liquor amnii filling up the uterus, so as to permit the easy change of position of the fœtus, and the labors that occur before term, may favor this evil. And in deformed pelvis the failure of the entrance of the head, on account of contraction, under continued action of the uterus before the liquor amnii is evacuated, may be the cause of this part sliding over and occupying the iliac cavity, as having more room wherein to accommodate it.

Symptoms. — The presenting part is usually high up upon first examination, and descends very slowly. The membranous protrusion is more elongated than usual, and has been likened to the finger of a glove, but this would be a correct comparison only in a very few instances. The pains are more irregular in all respects, and generally quite inefficient, and after rupture of the membranes the cessation of them is more marked generally, contraction not recurring for a considerable time. The os uteri, although soft and easily dilatable, does not open rapidly or completely. The first stage of labor is usually tedious. The pains, after a tedious suspension, become gradually more active, and finally powerful, and press the part down into the pelvis with great force. The evacuation of the liquor amnii leaves the uterus dry, and it becomes tender and irritable; the vagina is also tender and dry, and the pains become agonizing in the extreme. The irritable state of the uterus, in some cases, causes it to act with great vehemence, and if the difficulty is not corrected the fibres are torn across, and all the horrors of ruptured uterus are added to the previous suffering. Or if rupture does not take place, the long continued but vain effort to expel the doubled fœtus exhausts its powers, and the pains subside amid symptoms of general exhaustion and collapse. In other cases the uterus seems to be taken at a disadvantage, and, expending its contractile efforts on the inequalities of surface, causes much suffering without pains exerting any expulsive influence. They gradually cease, and vomiting, quick pulse, delirium and coldness initiate a fatal prostration. Or in some very rare but very fortunate instances, where the uterus acts with great vigor and persistence, and the child is small compared to the size of the pelvis, the fœtus is expelled notwithstanding the unfavorable position. This is undoubtedly effected in some instances, as observed by Denman, by the shoulder gradually rising up over the brim of the pelvis, while the breech sinks into the other side of the cavity. This is spontaneous evolution. There is an equal certainty that in other cases the shoulder is forced down to the inferior strait until it gets under the ramus of the ischium, and pressed around it, sliding up toward the symphysis pubis, more room is given to the rest of the body, and the hips enter the pelvis at the sacro-iliac junction, and glide into the hollow of the sacrum; the shoulder is urged still further up under the symphysis, while the hips pass over the perinæum and are expelled. In this method of expulsion the child is turned so that the breech is expelled first; but the version takes place within the pelvis instead of at or above the brim, as in the cases observed by Denman (Figs. 136 and 137). I think the term spontaneous evolution is just as applicable to this as the other method of expulsion, the head being the last part extruded from the organs.

Diagnosis of these impracticable presentations is all-important at an early time during the labor, as the success of treatment is very much more likely if instituted in the first stage of labor than if postponed until this is completed. The shape of the abdomen is different from what it is in correct presentations. The uterine tumor is broad and somewhat oblique in shape instead of oval. Upon attentive examination externally, the head may be felt in one groin and breech and legs on the other side, and somewhat higher up. In the absence of pain, if the abdominal walls are not thick or rigid, a little practice will enable us to judge of the position by external examination with a good deal of certainty. In manipulating the abdomen for this purpose our object should be

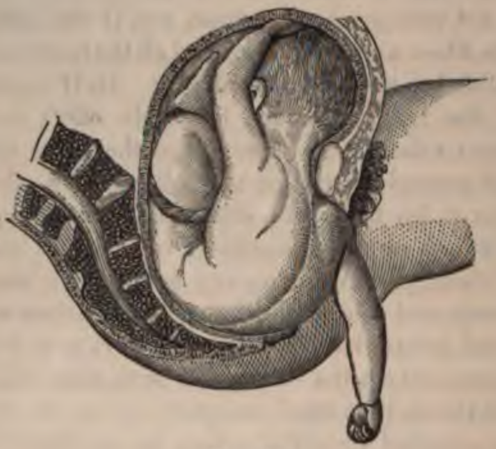


FIG. 136.

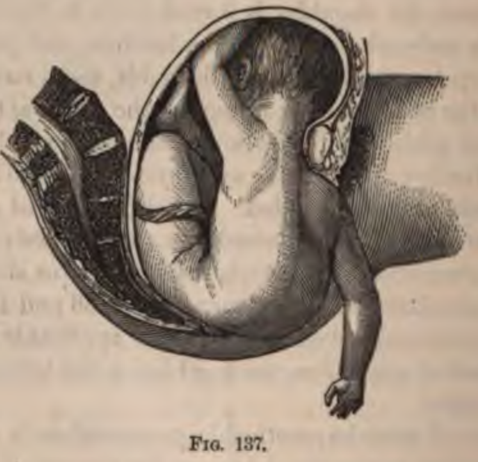


FIG. 137.

to grasp the parts by pressing our fingers down around them, and then forcibly grasping them, we can judge between the firm bony tumor formed by the head and the more yielding breech. The limbs will be within reach and may be recognized. The broad shape of the tumor may be simulated by the presence of twins; but in this case the rotundity and central position are preserved, which is not usually the case in shoulder presentations. But if we auscultate the tumor carefully, and there are twins, we may distinguish the separate pulsations of the two hearts at different points in the abdomen. In case of shoulder presentation, the heart is heard to pulsate low down, and not exactly in the centre of the abdomen. External examination is a valuable means of diagnosis, but is generally regarded as insufficient, and must be corrected or confirmed by internal examination; so that we resort to the vaginal touch to perfect our diagnosis. As the presentation is high up, it will be necessary to use two or more fingers introduced into the vagina in order perfectly to reach it. We may reach the parts in a more satisfactory manner by examining that portion of the presentation next the pubis, by passing the fingers close up behind that bone. We should be very careful not to rupture the membranes, consequently the touching of the parts must be done in the absence of pain. The laxity of the membranes will enable us to distinguish the parts better than when rendered tense by contraction. While the fingers are carried high up in the pelvis, a hand should be placed on the uterine tumor and moved about, so that the parts touched inside may be made to glide over the fingers. The parts may be more easily recognized when in motion in this way than when entirely quiescent. A shoulder presentation is distinguished from the head by not being round, and not filling up equally all the pelvic cavity. The fingers will generally pass up close behind the symphysis so easily as to indicate space not fully occupied. By carefully examining in detail, we may find the pointed acromion process, pass the finger into the axilla, and feel the ribs. To distinguish the ribs we must pass the fingers up beyond the most prominent point. This may usually be done close to the symphysis. Behind the symphysis we can almost positively feel the scapula, or the sternum and ribs, as the fingers at this part may be made to enter the abdominal cavity by passing above the brim. From the breech it may be distinguished by the absence of the signs of the latter, the genital organs, and the anus, which can easily be distinguished in the latter. If the elbow is flexed, so as to come somewhat before the side, we will be in danger of confounding it with the knee only, from which we may ordinarily distinguish it by its more pointed olecranon and smaller size; but the surest and best way is to push the fingers beyond it, behind the symphysis, in order to feel for the ribs or breech, which we can readily discover in immediate proximity. We may not embarrass ourselves by any doubtful or difficult search for other distinguishing marks if the membranes have been broken, but at once bring down the member and examine the foot or hand, whichever it may be. If, before the membranes are broken, the hand is at the brim, it may be distinguished from the foot, the only part with which it can be confounded, by the unevenness of the digital projection. The thumb and great toe contrast so decidedly that there is not much danger of being deceived. The toes are not so movable as the fingers, and they especially will not bend with the same facility; but after the membranes are ruptured and discharge the liquor amnii we will have no farther difficulty. The student, of course, will not commit the imprudence to rupture the membrane in order to make his diagnosis, unless the proper time has arrived for operation, and he does it after introducing the hand ready to turn and deliver the fœtus.

When the side presents itself without the arm or shoulder, the ribs are the distinguishing marks, and we can generally be sure of them by carefully searching for the intercostal spaces, pushing the fingers up posteriorly to find the scapula or sternum, one or the other of which may almost always be readily found. *The back* may be recognized by the ridge formed of the spinous processes of the vertebræ. We may detect the scapula on the soft spaces between the ribs and the iliac bones, as also the ribs and intercostal spaces. If the *belly* presents, the soft sensation imparted to the fingers is so marked as to be easily recognized. The umbilicus, with insertion of cord, may generally be felt, and the cord will be more or less prolapsed. If the *anterior part of the chest* is at the superior strait, the sternum, with the ensiform cartilage, with the ribs at the side, should be discriminated. The sternum is so short as not to reach from one side of the pelvis to the other, so that we may find the neck or abdomen at one of its extremities. Sometimes there is one or more hands and feet at the entrance of the pelvis, and both of them may not be apprehended if we are not careful diligently to examine their shape, size, etc. The student should avail himself of all the means for diagnosis; the external examination made with care and thoroughness, with a view to get all the information from that source, and the introduction of the fingers high up in the vagina, and co-operating with the two hands, one on the abdomen and the other in the vagina, and with the hand on the fœtal tumor above, move it about so that the part in contact with the fingers in the vagina may be made to glide over them, or be pressed more strongly down upon them, thus making the impression gained by the sense of touch more decided. If the practitioner will practise the external examination habitually, and educate his perceptions of the form and consistence of the parts of the fœtus as felt through the abdominal walls, as well as by touch per vaginam, there will be not much, if any, more difficulty in determining correctly the position of the fœtus by this method than the one usually practised, and it will always be valuable as corroborative and corrective of the vaginal examination in obscure cases. The double examination, conducted together with one hand outside and one inside, is also a very valuable plan of conducting the diagnosis.

Having recognized the vice in the presentation, it becomes our duty to avail ourselves of the earliest opportunity to correct it, by changing position of the fœtus so as to bring its long diameter to correspond with the pelvic axes. The head or breech of the child must be brought to the brim of the pelvis, and caused to enter it, in place of the impracticable presentation. We should, if possible, accomplish this early, because it is an easy thing to make the change while the uterus is replete with liquor amnii, and it is sometimes impossible after the uterus has been emptied of this fluid. The process of change is called *version* or *turning*.

When the fœtus presents crosswise, its position may be changed so that the head will be at the superior strait—*cephalic version*—or so that the breech may be made to present—*pelvic version*—or the feet may be brought down—*podalic version*. The circumstances of the case will determine to which one of these positions the presentation may be changed. If the head is near the brim of the pelvis, and part of the fœtus has entered the superior strait, and the whole is easily moved, it will be more convenient to bring it down than any other part. In a case of consultation a few weeks since, I was enabled to bring the head down from the left iliac fossa into the superior strait by external manipulation alone; the occiput passed down to the right groin, and the labor terminated very happily in six hours afterward without further assistance. The general arguments in favor of this change, or cephalic version, are those in favor of head over any presentations, and that it may often be more easily effected by external manipulation than version of any other part. The arguments against this kind of version are that the position of the presentation cannot always be regulated so as to make it favorable, and that flexion of the chin on the chest is generally injuriously effected; that is, the head will in some instances not be favorably situated in reference to the diameters and axes of the pelvis. If there is a close correspondence in the diameters of the head and pelvis, the difficulty will require further interference. And if further interference is called for, it cannot be so easily rendered as if we had the feet to operate upon. If the pelvis is roomy compared to the head, the pains strong and frequent, and the change can be readily effected, it is the best of the three undoubtedly. If, however, the pains are weak, the pelvis rather under size, and the head somewhat remote, it must not be thought of. The pelvic version or the podalic is the most frequently resorted to, the podalic much more so than either of the others. The change to the pelvic extremity gives us great advantage in the delivery, inasmuch as we can use the feet, legs, or the flexures of the thighs upon which to make traction. As the head—the most difficult part to deliver—comes into the pelvis, we may with this advantage change it to the most favorable position, and draw it through a pelvis contracted somewhat, if necessary. To the mother and the operator this is the best version; to the child—supposing both are perfectly performed—the cephalic version is the best. There are also three general methods of turning, 1st, by external manipulation; 2d, by external and internal manipulation combined; and 3d, by internal manipulation. The first, when practicable, is by all odds the best for both mother and child, and is sometimes quite easily and readily accomplished;—in some instances it is difficult, and in others entirely impracticable. The second ranks next in desirableness and difficulty. The third is more frequently practicable, but never as safe to mother or child. For version by *external manipulation* several conditions favor it very much, if they are not absolutely necessary. The liquor amnii should not be evacuated; no part of the fœtus should be impacted into the pelvis, nor the abdominal walls be too thick or rigid, and the parts of the fœtus correctly and easily distinguished through them. It has been proposed and practised by some to perform version by external manipulation during the last month of pregnancy—the endeavor to place and keep the fœtus in the right position for some time anterior to the occurrence of labor. But when it is remembered that the fœtus may change its position often during this last month, and sometimes even during the first stage of labor, this proceeding cannot be justified on the grounds of expediency; and if it is not expedient or necessary, it may be ranked among the improper and unjustifiable operations. It is further objectionable because it keeps alive in the mind of the patient mischievous apprehensions. We should not think of version, therefore, until labor has begun; but the earlier we can accomplish it after labor has begun the better. When we have determined to attempt version by external manipulation, the woman should be placed on her back near the edge of the bed, with her head toward our left hand when we stand facing the bed; her shoulders should be elevated, and the legs and thighs flexed in such manner as will most relieve the tension of the abdominal muscles, and the abdomen should be uncovered. Standing before the patient in such position as will enable us to stoop somewhat over her, we make a careful survey of the position by grasping the head, feeling for the arm and leg nearest the wall of the abdomen, and, if necessary, making an internal or vaginal examination. The examination and the manipulation for version should be made in the intervals between the pains. If the position—which is the most common—is with the head in the left iliac region of the mother, and the breech higher up and to the right side of the mother, the palm of the right hand must be placed over the head, and its carpal extremity pressed down between the groin of the woman and the head of the child, while the fingers lie over the head. When we feel that the hand has thus secured a bearing upon the head, we may push it upward along the iliac fossa toward the fundus; while the palm of the left lies flat upon the breech, with the fingers pressed in above it, draw this part down toward the pelvis. As fast as the head rises and the breech descends they should be held in position, and if a pain supervenes we may maintain this position as nearly as possible until it passes off, when our efforts may be renewed until the change is completed, etc. After the change to a normal position is effected, it will be necessary to keep pretty close watch of it until fixed by evacuation of the liquor amnii, or by the pains pressing it into the pelvic brim. These manœuvres will require gentle firmness and perseverance. One who has not tried it is apt to fear too much the resistance of the uterus; but this organ does not usually contract so but that, by seeking the proper time—between pains—but little resistance is experienced. If the head is in the right iliac region and the breech in the left side, the left hand of the operator may be pressed down between the head and the ileum, with the right over the breech, and bring down the breech while the head is elevated along the right side of the mother. It is not to be expected that we can succeed in turning the fœtus in all cases after this method with as much

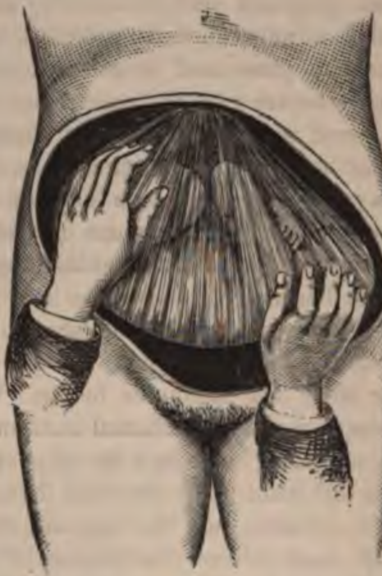


FIG. 138.—In this figure the fœtus is divested of the uterus and the abdominal walls, in order the better to exhibit the method of applying force.

facility and certainty as by introduction of the hand; but in very many instances it will not be difficult; and it is to be hoped that a persevering effort will be made by the practitioners of this country to educate themselves for this purpose, as there are so many good reasons why it is to be preferred to introducing the hand into the uterus. When, after proper and persevering trial to turn by external manipulation, we find it entirely impracticable, we still have the two other methods left us. To effect cephalic version on the same plan, if the head is in the left iliac fossa, the fingers of the right hand are pressed into the abdomen above the head, while the palm of the left hand is placed under the breech on the right side, and elevating the breech while the head is drawn down to the pelvic brim, and there retained, by maintaining the parts as changed until they are fixed by the action of the uterus. After changing the fœtus to the longitudinal position, if the occiput is forward, we may place the finger upon it and press it down as much as possible, with a view to insure flexion of the chin upon the chest and consequent good position of the head in this respect. It may also be moved to one side so as to make it assume the diagonal position. If, however, the occiput is backward, we can better secure flexion by pressing our fingers against the neck and pressing it backward and downward. It is practically of the first importance that the head enter the pelvis diagonally, and that it be well flexed upon the chest; hence we should make an effort to secure these two conditions when we resort to the cephalic version. In many instances the head is so near the brim of the pelvis that very little action upon it will cause it to descend and enter the pelvis, and if this can be effected while the uterus is acting well it is a very desirable change; but much of the advantage of head presentation would be lost unless the vertex can be properly directed also. The directions, therefore, to flex the head upon the chest and give the vertex a diagonal direction ought to be attended to. *Internal and external* manipulation combined will enable us to turn and change vicious presentations in some cases when the external alone would fail. This is especially the case where the presenting part has been made to partially enter the superior strait; and this method is applicable also to cases in which the liquor amnii has been evacuated, as well as those where the membranes have not ruptured and discharged this fluid. The os uteri must be partially—and it is better if wholly—open, but it should be dilatable. As this operation is likely to cause more pain, and stimulate the uterus to increased action, the patient should be put under the influence of chloroform or ether, and placed in position so as to permit the free use of both hands. The patient should be placed on her back across the bed, with the breech at the edge of it, with her feet on two chairs at the side of the bed, the limbs being held as in the position for the use of the forceps.

Operation.—The right hand should be lubricated, and so many of the fingers—generally all four of them—introduced into the vagina as to enable us to reach the presenting part easily and completely, and elevate it above the brim. With the right hand inside, while it is elevating the part, pressure should be made in the direction of the head, so as to move it further from the pelvic brim. At the same time the fingers of the left hand may be passed between the head and iliac fossa below, and elevated, while an intelligent assistant depresses the breech on the other side of the abdomen. After the presenting part has been dislodged and started away from the pelvis the greatest difficulty is overcome; but the same kind of manœuvring should be continued until the breech has been fairly brought down to the upper strait. Of course all this effort must be made in the intervals of uterine contraction, and so soon as the contraction of that organ urges the presenting part strongly against our fingers we should desist from effort until it ceases, and then gently but firmly renew it. It is necessary to have a clear idea of the presentation, and the direction in which we are to move the parts of the fœtus, before commencing the operation. The same process applies to the case whether the head is on the right or left side of the pelvis, only remembering to move the parts in the direction of the head when we desire to cause a breech presentation, and toward the breech when our desire is to bring down the head. We should preserve the membranes entire as long as possible, if the liquor amnii is not evacuated, or until the position is entirely rectified, and the new presentation fixed in the pelvic brim. In all cases where there is a probability of success, one or the other of these two methods should be perseveringly tried before the third plan for turning, viz., by internal manipulation, is resorted to, because of the greatly increased danger to both mother and child. The dangers to the mother especially are very great, as twenty per cent. of them die after the practice of this last method of turning. The most common injury to the woman is inflammation of the uterus, that is sometimes moderate and causes very great suffering, but not of sufficient gravity to cause death; but the inflammation is sometimes intense,—spreading to the peritonæum and the surrounding organs,—and proving fatal in from two or three days to as many weeks. Toxæmic fever is another one of the results of turning by introducing the hand. The abrasions of the mucous surface of the uterus enable the vessels to imbibe the putrid material generally so abundant in the uterine cavity for several days after delivery. And this fever may run a rapid and fatal course, or be protracted to a long time of suffering, and then terminate fatally or in an uncertain convalescence. I think it should be a positive rule of the practitioner never to introduce the hand into the gravid uterus except under an unavoidable necessity. I am sure that a reckless carelessness obtains in this respect among too many members of the profession, and the cause of such recklessness lies in the examples of some of its teachers. The danger of introducing the hand into the uterus is not sufficiently dwelt upon nor prominently mentioned in the works upon midwifery.

Operation.—The woman should be placed on her back across the bed, the breech at the edge, with her feet on a couple of chairs, sufficiently wide apart to enable the practitioner to sit between them, and she should be under the influence of chloroform. The medical attendant should remove his coat, and bare his arms to the elbows, so that his clothes need not interfere with their movements. If the head of the fœtus is situated on the left side of the mother, the right hand is to be used, and if on the right side, the left hand is to be introduced. As turning is sometimes required when the head presents, it may be necessary to say that in such cases the hand is to be introduced, the palmar surface of which can be most easily placed in contact with the abdomen of the fœtus. If the occiput is to the left side of the pelvis, the left hand is to be introduced, and if to the right side of the pelvis, the right hand of the operator. Unless the physician is sufficiently ambidexter to be sure of using the left hand with efficiency, it would be better to use the right hand for operating under all these positions, especially if the membranes are not ruptured. The best time to operate is before the liquor amnii is discharged, but after the os uteri is dilated enough to admit the hand, or sufficiently soft and dilatable to allow the hand to pass easily. Everything being in readiness, the operator takes his seat between the limbs of the patient, and seeks an accurate diagnosis of the position. He next oils the dorsal surface of the fingers and hand to be used, and approximates the little and forefinger in front of the two middle fingers and places the thumb between them. If the fingers are now slightly bent forward, they form an imperfect cone. The hand thus prepared is to be introduced into the vagina with the palmar surface next the perinæum, while the labia are to be held open with the other hand. Sometimes the hairy surface of the labia rolls inward, rendering the introduction of the hand somewhat difficult. This may be obviated by the free hand taking each separately and everting them as much as is necessary. This may all be done either during or in the absence of pain, if the patient is under the influence of an anæsthetic. If she is not, the introduction into the vagina is to be done during pain. The hand thus introduced, the ends of the fingers will come in contact with the bones of the sacrum in the centre of its concavity. After the whole hand is lodged in the vagina, it may be turned with the palm forward, and in the absence of pain, still doubled into the conical form, passed into the cavity of the uterus. It should be introduced into the uterus in contact with the abdominal surface of the fœtus. If this looks forward, the hand must be passed up immediately behind the pubis, with palmar surface still forward, however, until within the cavity of the uterus, and then again turned backward toward the fœtus. If the abdomen of the child looks backward, the hand must be passed between it and the sacrum. After the hand has completely entered the cavity of the uterus search should be made for the feet. And the student should bear in mind that when normally flexed the feet are on, or very near, the chest of the child, and that consequently it will be only necessary ordinarily to move the fingers about but little in order to find one or both of them. But occasionally they are situated in a distant part of the cavity, and widely separated from each other. When one foot is found it should be seized between the middle and forefinger, and clinched by the thumb, so as to lay firm hold of it. If the uterus contracts while these movements are being effected, the hand should be spread out flat upon the body of the fœtus, and held quiet until the pain passes off, and then the search for the feet should be recommenced. It has been recommended, when the membranes are entire, that one finger be passed up between the uterus and membranes, three or four inches above the cervix, and then turned forward to rupture them and search for the feet, and when this can be accomplished it will save for us more of the liquor amnii, and the more abundant this fluid the easier the position of the fœtus may be changed. Many times, however, the membranes will be ruptured so soon as the fingers have passed the os uteri. Nevertheless, it is better always thus to try to save the liquor amnii. Grasping one or both of the feet, we change the position of the child by drawing the foot, or feet, in the direction of the superior strait, and through it until in the vagina, and they pass down as low as the external opening. The fœtus will be turned when this is the case, so that the uterine contractions will be expulsive, and we may draw upon the foot thus brought down until the breech occupies the pelvis. Afterward the case is to be treated as a breech presentation. These directions will apply to any position of the fœtus, except, perhaps, the umbilical presentation. In this case the hand must be introduced into the uterus at the side of the pelvis next the feet. When we turn in cases of cephalic presentations, we may expect to introduce our

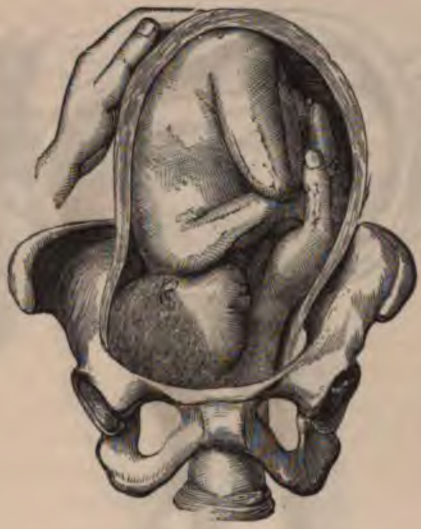


FIG. 139.

hand higher up into the uterus to find the feet than in cross births. While the hand is introduced inside the pelvic cavity, and manœuvering to change the position, we may often aid these efforts by properly using the other hand, externally, on the head or breech, as may

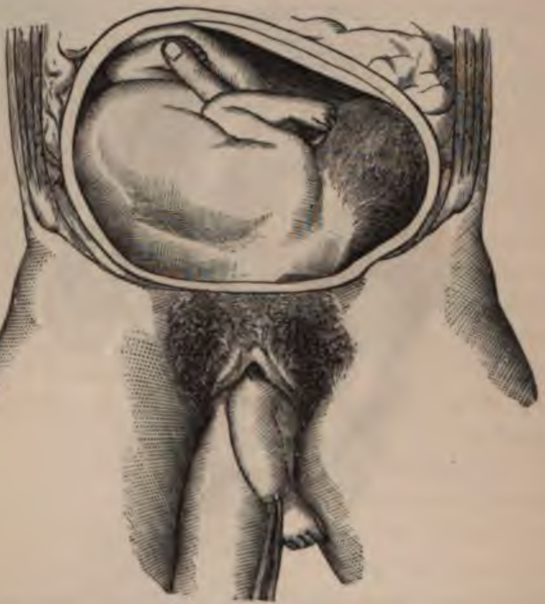


FIG. 140.

seem necessary at the time (Fig. 139). If it is necessary to accelerate delivery from any cause, we may make traction, at the time the uterus is acting, upon the feet and legs at first, and afterwards the body, shoulder, etc. But if not, after the position is changed and the parts have fairly engaged, we should allow the uterus to expel the whole of the fœtus as nearly as is compatible with the safety of the child, so that it may not be necessary to do anything more than superintend the delivery after the turning is complete. In all our internal manipulations for turning, the very least force necessary for the introduction, the search, and extraction, that is compatible with success, alone should be employed. Above all things, the power of the uterus should not be *resisted*. Turning after the liquor amnii has been evacuated is much more difficult as compared to the same operation before the membranes have been ruptured. After the fluid contents of the ovum have drained away, the tonic or elastic contraction of the fibres of the uterus cause its walls to apply themselves closely to the surface of the fœtus, filling up the inequalities about the hips and shoulders and between the head and neck, grasping it in every direction. To add to this difficulty, after the liquor has been lost for a considerable time the mucous membrane of the uterus becomes dry, and the fœtal surfaces do not glide over it easily, so that the fœtus becomes fixed, every part of the two surfaces clinging to each other so tenaciously that it is difficult to dislodge it. The pains in such cases do not have much tendency to expel the fœtus, and are expended mainly in more firmly grasping the inequalities of the body and limbs of the child. In searching out the limbs for the purpose of bringing down the feet, I have sometimes found one leg enclosed in a cylindrical-shaped contraction that bade defiance to any efforts to encircle it with a finger, and when the uterus contracted it was impossible to touch any part of it. Not only the difficulties of turning are increased by this condition of things, but the dangers are also very much greater to the mother, on account of the frequency with which this operation is followed by the diseases I have mentioned above. The dangers to the child

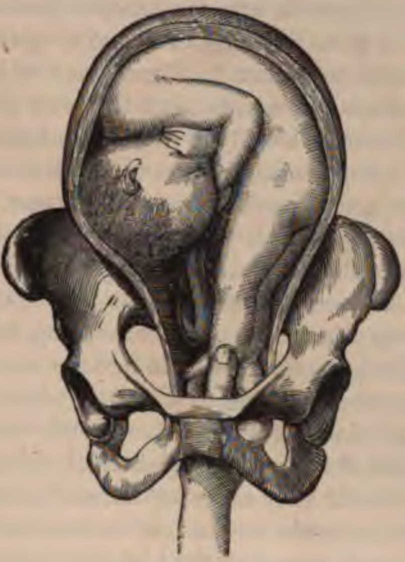


FIG. 141.

are also very much greater, for obvious reasons. If already dead, evisceration and removal, being less dangerous to the mother, should be practised. Turning, under these circumstances, is indeed sometimes entirely impossible, and evisceration is the only operation that can be practised. Other cases have occurred when turning became practicable after embryulcia had been practised. The same rules for introducing the hand as given for internal turning will avail us here as in the former conditions. But as the presenting part is always impacted into the brim of the pelvis, we will have more difficulty usually in getting the hand by it, and we can overcome the resistance only by working between pains, and persevering with great pertinacity and firmness. If the arm hang down in the vagina, it is better not to attempt to return it, but let it remain in that cavity, as it occupies less important room than it would if it could be crowded back in the uterus (Fig. 140). Sometimes we may seize a foot after introducing the hand into the vagina without passing the whole hand into the uterus; but searching about by one or more fingers the foot may occasionally be seized and brought down. When this can be done it is always very greatly better than to push the hand entirely up into the uterine cavity. But if they are not thus easily found we should, as gently as possible, in the absence of uterine contraction, carry the hand high enough up to find the feet or one foot. A firm hold should be secured, and the part drawn down as before directed. The contraction of the transverse fibres will hinder descent and resist our traction most; hence, when after moderate direct traction the position does not readily change, we should direct our efforts in a diagonal manner around the pelvis, varying the direction from time to time until the resistance is overcome. Very great assistance will be derived from external manipulation in overcoming the sacculated contractions. The head, hips, or other prominent parts may be acted upon by the hand externally. With the external hand, however, we must make more effort to dislodge by passing sidewise and diagonally, than by forcing the part up, or down toward the strait. It often happens that we bring down one or even both feet into the pelvis without materially changing the position of the child, and they have a strong tendency to retract, and sometimes do return into the uterus. In order to avoid the inconvenience of searching again, it is better to place a piece of tape around them, by which to keep them down, or to recover them when withdrawn from us by the action of the uterus or fœtus. In cases where the uterus is thus dry, much forcible traction will be necessary to complete the version. We should seize the limb brought down, or draw upon the fillet or tape by which it is secured, and make constant traction until a change has been wrought. If the traction is unremitting the force required to accomplish the version will be much less than if made in spasms. Indeed I think the failure to complete version in cases of this kind is due very frequently to want of steady continuance of traction. Half an hour, or even more, perfectly continuous traction fatigues the irritated fibres to relaxation. The time when the traction has seemed to me to be most effective is the instant immediately succeeding the cessation of uterine contraction, provided it is kept up during the pain and after it has ceased. So soon as the fœtus is dislodged from its position the difficulty is overcome, and the action of the uterus will complete the version and expulsion. As before directed, we may accelerate version in even as desperate cases as these by external manipulation to dislodge the sacculated portions of the fœtal body. It has been suggested to inject the uterus full of warm oil, when it has become very dry after the evacuation of the liquor amnii, preparatory to commencing the operation of turning, and I should think in some cases much good might be effected in this way. It may be done by introducing the flexible tube of a pump syringe high up into the organ and passing the oil through it. The tube can generally be passed beyond the presenting part around the body of the fœtus, so that the oil may be carried above it. An infusion of linseed or other mucilaginous fluid would answer quite as well, I should suppose. After the version is complete the delivery is conducted in the same manner as a footling case, and is usually easily accomplished.

General Management of Tedious and Instrumental Labors.—In tedious labors, exhaustion being among the most common results, we should endeavor to sustain the patient's strength by inducing her to partake freely of light nourishing diet. The diet should be light or easily digested, because the digestive capacity of the stomach is embarrassed by the excitement of the nervous system. The animal broths or their essences, ice-cream, milk if the patient likes it; and if the depression is quite decided, wine, egg-nog, tea, coffee, etc., may be very properly allowed. Cooling and refreshing drinks should be given her as her desire for them may demand. We should encourage her with the most favorable view of her condition, holding out every reasonable hope that nature will terminate her sufferings, and that failing in this we have the means at hand and at the proper time will use them for her relief. We are not to allow the nurse or her friends to influence her to the useless expenditure of her strength by futile efforts at expulsion, but must exhort her to quiet and patience. Chloroform or ether, particularly the latter, is a great solace in this extremity, and will enable the patient to sleep and refresh herself in a most grateful manner. It should not be constantly administered, but given only during the pain, as in natural labor. Above all things, the patient should have an abundance of pure cool air. To this end the room should be large and open, so that ventilation can be made good, and there should be no attendants in the room except such as are needed and useful. It is not necessary or proper to make frequent examinations, because the vagina is likely to become irritable and excited by the labor, and this will be increased by the presence of the finger. The bladder will need especial attention, as the pressure on the urethra often obstructs this canal, and the congested and tender condition of the mucous membrane makes it painful to urinate, so that the bladder will often not be evacuated, but become very greatly distended. The organ is thus very greatly endangered. It may be ruptured by too great distention, united to the pressure it is subjected to by the abdominal muscles, violent motion, and sometimes frenzied pressure made by the patient in her different attitudes. If this does not occur, it may be paralyzed and remain so for many months, and perhaps always, or inflammation may be induced by it. We should, therefore, often examine the state of the bladder, by placing our hand over the hypogastric region, and if it become distended, and the patient cannot voluntarily discharge it, the catheter should be resorted to. The pressure on the urethra makes it sometimes very difficult to introduce this instrument; but the flexible will generally pass in the absence of pain; and if the urethra is pressed together too much for this, the head may be lifted up, in the absence of uterine contraction, while the catheter is passed. The student should bear in mind that during labor the urethra is directed upward, and in all its course is immediately behind the symphysis pubis, and that the meatus urinarius, instead of being prominent and easily discovered, as it is in the ordinary condition of the parts, is sometimes drawn up within the pelvis, so that it cannot be seen without carefully separating the parts and searching behind the arch of the symphysis. We should be especially careful not to use force in the introduction of the catheter, as the parts are drawn into a state of tension and tenuity that renders them liable to be easily penetrated by the point of the instrument. If with these cautions catheterism becomes impracticable, and the bladder is greatly distended, we should not hesitate to resort to artificial delivery for this reason alone. For, in addition to the danger of rupture and other damage to which the bladder is exposed, great distention of it renders the action of the uterus inefficient, and even may arrest the pains.

Effects of difficult labor.—The effects resulting from tedious and instrumental labor begin before labor terminates, and are the reasons for interference and apprehension. They have already been alluded to, and some of them described, as the reason for the use of instruments. Exhaustion is one of them, and while it is quite easily recognized it cannot always be remedied by the termination of labor, and it continues after confinement, and occasionally increases to a state of deep and fatal collapse. We therefore have, as the sequel of difficult labor, all the gradations of moderate exhaustion, with weak quick pulse, languor, and general low condition of vitality, to the cold, damp skin, very rapid pulse, delirium, vomiting of coffee-grounds substance, and other evidence of complete failure of the powers of the system. When the exhaustion continues twenty-four hours after the termination of labor, without great amelioration, the prognosis is very grave.

The treatment for the lighter forms consists in the administration of nourishing diet, and rest in complete quiet. For the more serious degree there will be required, in addition to the quiet and nourishment, external and internal stimulants commensurate with the intensity of the symptoms, hot turpentine stupes to the legs, mustard to the epigastrium, warm cataplasms over the whole abdomen, camphor and opium internally, to allay the vomiting, as well as to act as a general stimulant, brandy and water in the rectum, etc. On several occasions I have noticed a singular condition of the abdomen follow very tedious labor, viz., great distention of the alimentary canal with gas. The distention was so great that the shape of the convolutions of the intestines could be easily seen through the walls of the abdomen. It is the cause of alarm generally, but if not attended with fever or great pain our apprehensions may be dismissed, as in two or three days it will have all disappeared. Minute doses of turpentine in emulsion, or seven or eight grains of assafœtida every four or five hours, will aid in removing it more rapidly. Camphor stupes may be very properly added. Inflammation of the uterus is not an unlikely effect of these labors. The patient is feverish, and the uterine globe hard and tender; the pains much more severe than ordinary after-pains, and there is a dull aching pain all the time; the lochia becomes scanty, or entirely suppressed, and there is a retardation, if not prevention, of the secretion of milk. If the inflammation is moderate, fomentations and a cathartic, succeeded by opiates in full doses, will be generally followed by relief; but if severe, cupping or leeches, succeeded by gentle ptyalism, must be added to the foregoing means of cure. The vagina and bladder are also attacked by inflammation, as a consequence of long-continued pressure of the head in the pelvis, that sometimes results in serious lesions in these viscera. The labia and mucous membrane of the vulva and vagina become swollen, hot, and dry, and painful, and upon touching them are very tender. In a little while the dryness is succeeded by a copious secretion of mucus, often mixed with blood, pus, and shreds of membrane, indicating ulceration. The discharges become fetid and acrid. Generally, although not always, there is detention of urine, sometimes incontinence, and occasionally merely painful micturition. There are more or less febrile symptoms present with these local symptoms. If the pressure has been very long continued and severe, there will be sloughing in these cases of post-partum vaginitis, and not unfrequently the slough lays open the cavity of the bladder or rectum, giving origin to vesico-vaginal and recto-vaginal fistula. The treatment consists in frequent emollient injections at first, followed, after the discharges become fetid, by carbolic acid and astringent medicines, as lead, tannic acid, etc. In bad cases of post-partum vaginitis the bladder should be kept almost absolutely empty by frequent use of the catheter, or by keeping it in the bladder, until the force of the disease has passed. As this kind of vaginitis is the reactionary consequence of pressure sufficiently violent to almost destroy the parts, it is of low grade, and the general treatment should be sustaining, tonic, and even stimulant. For a more detailed account of this affection, see "Medicine and Surgery of Women."

In other instances the *bladder* seems to be *paralyzed*, without there being much inflammation. This condition lasts sometimes only for a few days, while in other instances it remains an obstinate affection for several months. While it continues the urine is not expelled, but accumulates in large quantities. The catheter should be resorted to, in such cases, about every eight or ten hours. The practitioner can easily show an intelligent nurse how to use the instrument, and this will be much the most convenient plan where it must be continued for some time. Fomentations, emollient injections in the vagina, and bathing the urethral orifice, first with emollients, and afterwards a solution of tannic acid, should constitute our treatment for the first few days. So soon as the period of excitement has passed, we may give eight or ten grains of pul. ergot every four or six hours. I have seen these cases relieved very promptly by the ergot thus given. If after a few days the infirmity still continue, strychnia and galvanism afford a prospect of relief. Belladonna, carried to its full effect, has sometimes relieved this troublesome disorder. Pressure upon the nerves passing through the pelvis, especially the sacro-sciatic, sometimes causes obstinate *neuralgia*, and occasionally temporary *paralysis of the limbs.* I have seen some distressing cases caused by the pressure where the forceps were used—most likely by the pressure of the edge of the blades over the branches of the sacral nerves as they pass over the sacro-iliac junction. This difficulty generally subsides in a very few weeks, but sometimes it lasts for months. The antiphlogistic treatment, locally and generally, must be resorted to for the first week or two, as cupping or leeching, emollient injections, cathartics—one or two of which should be mercurial. This should be followed by counter-irritation over the sacrum, and iodine internally. Strychnia and galvanism may bring up the rear of this array of remedies, in such manner as may seem appropriate in considering the symptoms of the case and the effects of the remedies.

INDUCTION OF PREMATURE LABOR.

To avoid the necessity of the dreadful operations detailed for the relief of suffering women in the conditions described in the preceding pages, the induction of premature labor has been practised successfully. Labor is induced at a stage of pregnancy when the fœtus is viable, and yet has not attained to a bulk so great but that it may pass through the pelvis without mutilation. Should the pelvis be contracted to a size below a measurement through which the fœtus might be delivered in a viable condition, and its life must necessarily be sacrificed for the safety of the mother, sometimes it will be better to induce abortion. This operation is justifiable when such is clearly the condition of the woman; but the practitioner cannot conscientiously resort to this measure upon the statements of the parties concerned as to the capacity of the pelvis. He must assure himself by a careful measurement at the time, or have witnessed the difficulties experienced in labor at full term. Indeed, this precautionary measure must be our safeguard against mistake or imposition in the induction of abortion or premature labor. With this understanding of the difference of purpose between the two, the remarks that follow will apply to either. In all cases below two and a half inches antero-posterior diameter we cannot expect to save the fœtus except by gastrotomy, hence abortion will be the proper measure; above two and a half inches the induction of premature labor will be the right operation. While rare instances are on record of children being born in a viable condition during the seventh month, for practical purposes we cannot calculate upon such a condition until the end of it. At that time the bilateral diameter of the head is about two and a half inches, perhaps a little above this, but the bones are so flexible, the sutures and fontanelles so open, and the brain so soft and compressible, that this diameter may be reduced to less than two and a half inches. In addition to the mere decrease of the size of the head from pressure, it may be made to assume a different shape, to suit the tortuous contractions sometimes observed. This procedure is justifiable in cases where the antero-posterior diameter of the pelvis measures from two and a half up to three and a half inches. And as the longer the fœtus is allowed to remain in the uterus, the more likely it is to live after being born, it is a duty the accoucheur owes to it, to determine the uttermost day it can continue to develop and strengthen, and not increase the risk to itself and mother. At seven months the fœtus may pass through a pelvis two and a half inches; at seven and a half months, two and three-quarters of an inch; at eight months, three inches. The damage resulting from premature labor to the mother is slight, compared to that resulting from the other grave operations at full term; and yet it is not free from danger, as it is sometimes followed by metro-peritonitis and other serious and fatal affections. The child is uniformly sacrificed in abortion; and in cases where premature labor has been induced, the fœtus is lost in nearly fifty per cent. This great mortality among the children results in some measure from the malposition so frequent in these cases.

Mode of operating.—A great many methods of inducing premature labor have been devised, tried, and extolled by different persons, but I shall not describe them all. I will only mention those I most approve. They all have one of two objects in view, and some of them both of these objects. Some of them open the os uteri largely, and thus indirectly cause uterine contractions; others operate upon the irritability of the uterus, inducing contraction, and in this way bring about dilatation of the mouth of the uterus by causing the contents of the uterus to be pressed down into it. The means of dilating are the compressed sponge, Barnes' elastic dilators, and the fingers. Compressed sponge has been brought into such general use for dilating the mouth of the uterus that it is not necessary to describe it. It comes in cases of various size and length. To commence with it for the induction of premature labor, a piece about an inch and a half long, of the size at the large end of a goose quill, may be passed up—by means of a strong forceps or a sponge-carrier made for the purpose—point foremost into the cervical canal, so that the sponge touches the membranes. At the end of six hours this may be removed, and replaced by one double the diameter of it, and so on every six hours, increasing the size of the sponge to double diameters. In less than twenty-four hours the mouth of the uterus may be opened large enough to permit the passage of the fœtus, and, generally, the labor pains will have been established. The sponges should all have a strong tape attached to them, that they may be readily removed by drawing upon it. This is a very efficient method of starting up the process of labor, but it cannot be consummated so rapidly, according to Dr. Barnes, as by the use of his dilators. These dilators are strong india-rubber bags, with a long tube attached to one extremity, through which air or water may be injected to distend it. These bags are of three sizes; one, when distended, is about three-quarters of an inch in diameter; another, an inch and a half to two inches; and the larger may be distended so as to measure four inches or more in diameter. The small one is about two inches long, and the larger one three. They are constricted somewhat in the centre, and have been likened to the shape of a fiddle. When collapsed the small one may be introduced into the cervix with very slight dilatation.

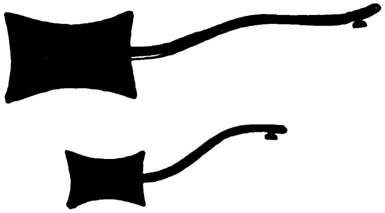


FIG. 142.—Barnes' Dilators, two sizes.

On each side there is a sort of pocket, into which a piece of whalebone or other instrument may be inserted, with which to crowd it into the cervix uteri. They are used much like the sponge, the small one being passed up until one end is in the cavity of the uterus, and then inflated with air or filled with water by means of the syringe. The air or water is retained in them by a stop-cock on the tube. In an hour, more or less, according to the dilatability of the os, the small one will have effected its utmost results. The second may then be introduced, and filled and allowed to remain until it is no longer of use, and then the larger one should succeed it. In filling up these bags it is better to remain with the patient, and throw the water up slowly, only causing the distention as we find the parts yield. Dr. Barnes thinks delivery can be effected in a very few hours by this method. I have not tried them. The mouth of the uterus may be dilated with the fingers in as short a time, and with no serious risk to the uterus. In three or four hours it may be made large enough to permit the passage of the fœtus. I have on several occasions accomplished this dilatation in less than four hours. It is fatiguing to the operator, but it may be resorted to when we have no sponge and cannot procure Barnes' dilator, and is as effective as any other measure we can employ. The uterine globe may be pressed down low into the pelvis with the left hand, or by an assistant, until the mouth of the organ is brought within easy reach of the fingers of the right hand. The index finger may be first pressed slowly into the cervix, up to the membranes, and swept around the circle of the os internum gently, and continued in that position until the parts relax so that the finger is not constricted by it. A gentle but firm effort should next be made to pass the middle finger, and in a short time this will be accomplished. It should be inserted into the cavity of the cervix, and also carried up to the os internum. The two may now be separated gently, but perseveringly, until the third finger can be introduced. Pains are quite likely to succeed these efforts, and aid in the dilatation. In all three of these methods of dilating the os we should be careful to avoid rupturing the membranes, and unless they are unusually fragile, we will succeed without much difficulty. If the presentation is correct, either breech or head, after the dilatation is complete the membranes should be ruptured, when the contractions will be more energetic. Should the presentation not be right, it should be corrected before the membranes are ruptured, by pressing the presenting part upward in the absence of pain, with the fingers of the right hand introduced into the vagina, and manœuvring with the left hand above, as will be described in the future. So soon as a good presentation is secured, the membranes are to be ruptured, and the labor managed according to the circumstances as they transpire, and are governed by the rules for the management of labor.

The means for inducing contraction before dilatation are the douche, the ordinary flexible bougie, and the rupture of the membranes. The douche is uncertain, but in some instances it is quite effective. The best way to use it is to direct a stream of water against the os uteri, and partly in it, half an hour at a time, every four or five hours. A large bucket or tub may be elevated six or eight feet above the patient, and a small tube or hose leading from it conduct the water into the vagina. The tub may be filled with warm water first, about ninety-five to a hundred degrees Fahrenheit, and after all the warm water has run out, filled again with water about sixty degrees, and this allowed to pass through the vagina. The patient may be placed on the edge of the bed, with an india-rubber blanket beneath her, and so folded as to carry the water into a receptacle on the floor. This may be repeated every six hours, or even oftener, until the uterus begins to act energetically. A flexible or elastic catheter is used to bring about contractions by directing its point up behind the membranes in the posterior part of the uterus, and pushing the instrument entirely within the uterine cavity. This can be done without rupturing the membranes, if the operator is careful not to use too much force. Two or three small catheters may be thus introduced, or small catgut cords may be used in the same way, several being introduced at different points in the circumference of the body of the uterus. In a few hours these foreign bodies excite the uterus to active contractions, the membranes are urged forward into the cervix, dilate it, and thus labor proceeds. This is a very safe way of exciting the organ, and in the progress of contraction and dilatation very closely resembles natural labor. First, the pain; second, the dilatation and evacuation of the liquor amnii; and third, expulsion.

But the uterus may be excited to action with almost infallible certainty by rupturing the membranes with a probe or catheter introduced through the cervix uteri. When the fœtus is dead, or the other methods fail, this can be resorted to with less trouble to the operator and less inconvenience to the woman. I think ergot an unfortunate expedient for the induction of premature labor. In addition to the terrible energy with which it causes the uterus to embrace the frail fœtus, its poisonous effects, now so generally recognized, ought to exclude it from use in all cases where the life of the fœtus is of any value. It is applicable in precisely the same class of cases that rupturing the membranes with a probe is, viz., when the fœtus is dead, or too young to live after being expelled. The probe and ergot, one or both, are also useful, perhaps more so than any other means, where abortion is to be induced.

Malposition of the fœtus occurs very frequently in premature labors, either accidentally or they are induced artificially. It is an important duty in the management of these cases, therefore, to inquire early into this matter, and if the position is wrong to endeavor to rectify it before the membranes are ruptured. One of the great objects is to effect the delivery with as little manipulation as possible, remembering the tenderness and frailty of the fœtus. If turning becomes necessary after the membranes are ruptured, great care is necessary in bringing down the feet and drawing them through the constricted pelvis. The labor is almost always tedious, and may often be otherwise difficult, so that the general management of the patient will be the same as I shall have occasion to describe under the head of management of difficult labors. In some cases we may be driven to the necessity of using the forceps or even the crotchet to effect delivery, as there may be vice in the formation and proportions of the fœtus, the same as if it had remained until the end of term.

GASTROTOMY—CÆSAREAN SECTION.

This operation, as practised upon a living woman, is designed to remove from the uterus through the abdominal walls a fœtus that cannot be delivered through the natural passages; and upon the dead mother to save the life of a fœtus that may not have perished at the same instant of time with the mother, and whose life may possibly be saved by extraction. In the first case it is done wholly for the benefit of the mother, to rescue her from the terrible results of a retained fœtus; in the second, entirely for the benefit of the fœtus. For this last purpose gastrotomy is an ancient operation among the Greeks and Romans, and perhaps other ancient peoples. The law made it a duty of the surgeon to open every woman who might die at or very near the end of gestation, and remove the fœtus. And whether true or not, we are informed that Æsculapius, Scipio Africanus, Manlius, Julius Cæsar, and Edward the Fourth of England were thus rescued from a ventral tomb and saved to fame and usefulness. We are not able to trace with any certainty the history of the operation, as performed on the living woman, back beyond the fifteenth century. Nicholas de Falcon is credited with having removed a fœtus from a living woman in 1491. Nufer and Rousset, in the sixteenth century, both became famous for their achievements in this operation. Rousset, in 1581, wrote a book reporting successful cases, and advocating the safety and expediency of gastrotomy so energetically that it became a popular operation, and we are told practised frequently even without definite indications. Paré and Guillemeau opposed the operation with much ardor and judgment. A reaction finally resulted in a more sober estimate of its danger, and now it is an uncommon operation, not entirely on account of its formidable character, but more because our science and morals enable us to place it where it belongs, as a resource in grave extremities instead of an operation of expediency.

The indication for gastrotomy in the living woman is an occlusion of the pelvis, from distortion or tumors, to such an extent as to make it impossible to deliver through that canal after the greatest comminution of the fœtus that can be practised. This is just about the only justifiable condition, except in some instances resulting from accident, and which will be noticed in another place. A disproportionately large head may be reduced by craniotomy. A pelvis measuring decidedly less than two inches in diameter—certainly when the narrowest direction measures no more than one and a half inch—it will be impossible to deliver an ordinary-sized fœtus through it by any means whatever. This can only be ascertained by the most painstaking measurement. The reader is referred to the description of measurements for instruments and instruction in their use.

In cases of sudden death of a woman at full term or very near to it, the indication is to perform the Cæsarean section for the safety of the child. The indication is the more imperative if the disease has been of short duration and sudden termination, or the woman has been the victim of an accident that has suddenly deprived her of life. Too little attention is paid to this indication, and instead of post-mortem gastrotomy being the rule established and enforced by law, it is of extremely rare occurrence in this country, if not indeed anywhere at the present time. One cannot read the history of the operation without being convinced of the great usefulness of it applied in this manner among the ancients. The only thing necessary and preliminary is to be sure the woman is dead, and the next is to do the operation as soon as possible after we are assured of this fact. It is better to perform the post-mortem operation with great care, lest the patient, if not dead, might be placed in more than necessary jeopardy from neglect of the appropriate minutiæ. I know that it is not always practicable to do this operation, from being absent at the proper moment, and being unprepared with the needful means, but I know also that sometimes these difficulties may be obviated. It is furthermore a matter of uncertainty how long the fœtus may survive the mother; and it is also probable that there is great difference in this respect, owing to the various conditions in which persons are left in death from different diseases or accidents. Cases are on record, however, well authenticated, of living fœti being removed after death, long enough to make the most deliberate preparation for the operation, and failure only results in the loss of our labor; we can afford to fail a great many times if we only succeed once. Statistics of gastrotomy are very meagre and unreliable, because, mainly, the unsuccessful cases are not reported; but, even imperfect as they are, they are better than no statistics. In Great Britain the mortality to the mother is about eighty-one per cent., so far as can now be made out. On the Continent of Europe, where it is much more frequently resorted to, the mortality is not so high, being about forty-three per cent. In America our reports, according to Dr. Playfair ("Obstetric Operations"), a British writer, give a mortality only of about thirty-four per cent. This last is but little greater than the aggregate mortality in ovariotomy. The high mortality attending gastrotomy must to some extent depend upon other considerations than the mere dangers of operation alone. Dr. Gibson operated successfully twice on the same woman, and this has been done by others. But in all these instances the patient and operator were both prepared in the most appropriate manner, and the proper time selected; but in by far the larger proportion of cases the patient is in the worst possible state from protracted labor, and generally injudicious efforts at delivery have been made by some other method, and performed by a practitioner not familiar with the details of its surgery and subsequent pathological effects. Doubtless if the same favorable conditions could be commanded that generally obtain in ovariotomy, the success would be as good. I do not believe that the dangers of the operation in gastrotomy are any greater than in ovariotomy. For the sake of the mother and child both, the operation should not be delayed longer than the completion of the first stage of labor. And if the membranes rupture and allow the liquor amnii to escape, and the os uteri is dilated to an inch in diameter, large enough to present a free lochial discharge, the operation should not longer be delayed. If we can have time to prepare our patient, her general health should be put in the most vigorous condition by regulating the diet, bowels, and digestion, and giving tincture of iron for some time before the operation. The advice of Cazeaux, to bleed and use warm baths for several days, is not in accordance with the enlightened pathology of the present time, and will not be followed by many practitioners of experience and judgment. The causes of death after Cæsarean section are very much the same as in ovariotomy, viz., shock to the nervous system, hemorrhage, and metro-peritonitis. The shock is most likely to be avoided by the use of an anæsthetic,—sul. ether I regard as the best for this purpose. The hemorrhage has three sources: from the vessels of the abdominal walls, from those of the uterine walls, and the placental surface. The first may be avoided by the careful operator generally, and the last depends upon the firm contraction of the uterus, as in ordinary confinement, by closing the bleeding vessels. The same means will secure the contractions in both cases, kneading and grasping the uterus, and the administration of ergot. The inflammation will be avoided by carefully watching the patient and regulating the diet, provided the peritoneal cavity has been properly treated. The danger to the child is increased with the delay of the operation after the liquor amnii has been evacuated, and is greater according to the difficulty of extracting it from the uterus after the incision is completed.

Operation.—The bowels should be emptied by a cathartic when we have time and it is practicable; if not, with an injection. The cathartic ought to be used immediately before the commencement of the operation. The operator will need a scalpel, blunt-pointed bistoury, grooved director, tenaculum, artery forceps, scissors, one dozen straight needles two inches long, armed with silk well waxed, ligatures for arteries, two or three fine sponges, some adhesive straps, a broad binder, and hot and cold water. The patient should be etherized in bed, and carefully placed upon the operating table in a good light. We should try and inform ourselves as to the location of the placenta. If situated immediately in front we may operate through one of the linea semilunaris, but if not, we should select the linea alba as the proper place. An assistant should keep the uterus in the centre of the abdomen, and press the muscles at the sides somewhat tensely against its sides, while another depresses them against the fundus from above, in order to prevent the intestines from rising up over the uterus, and to facilitate the incision by giving us a firm substance upon which to operate. The incision should begin two inches below the umbilicus and extend to within an inch and a half of the pubes, in the median line. An incision through the integuments the whole length of the intended opening may be made by a single prolonged stroke of the knife; after which the rest of the tissues should be carefully dissected through at the lower angle of the wound, where the intestines are less likely to get before the uterus, until the peritonæum is reached. This membrane should be pinched up by the forceps or thumb and finger, and cut through while quite elevated above the subjacent viscera. We will thus avoid all risk of wounding any organ in the abdominal cavity. The wound in the peritonæum enlarged sufficiently to permit the finger to pass into it, this member may be passed up beneath the incision in the integuments, and act as a guide to the blunt-pointed bistoury, which should be carried along its palmar surface, and the deep wound enlarged to the size of that in the integuments. The uterus will then be exposed, and in the absence of pain—while the patient is profoundly affected by the anæsthetic, so as to very greatly lessen the uterine pains—the uterine tissues at the centre of the external wound should be divided by successive delicate strokes of the scalpel, sponging the wound of blood frequently, until the membranes become visible. When this is the case, the grooved director must be carefully inserted between the membranes and the mucous membrane of the uterus, and the wall divided, first above and then below, until the incision of the uterus is equal in extent to the wound externally. The membranous bag may be ruptured, and the hand quickly passed into the cavity of the uterus, and the fœtus seized by the neck, lifted out, the cord tied, and separated. The hand must be again passed into the uterus, the placenta seized and held until separated by the uterine contraction, and after the pain subsides withdrawn from the organ. We shall have but little difficulty in thus abstracting both the fœtus and placenta, if a judgment is warranted after an experience of two operations. The fœtus is generally exposed, and presents a beautiful spectacle after the uterus is cut through. We can easily see the position, and the shoulders and neck, so that we may lay hold of it unerringly at this part. After the child is removed, ligating and cutting the cord should be left to an assistant, while the operator, with liberated hands, may re-enter the uterus to grasp the placenta. Contraction occurs almost immediately, and is not so great as to risk anything by allowing the hand to retain hold of the placenta until it is separated, and in the relaxation that succeeds the pain it is removed. The wound need not be closed in a hurry; the assistants, who have all the time held the walls of the abdomen against the uterus, should keep their position and continue to perform this duty, which will serve to cause the uterus to contract, and the operator should watch the parts until he is satisfied there is no danger of bleeding from the uterine vessels into the peritoneal cavity, nor from vessels in the abdominal muscles. After having thus satisfied himself he should cleanse the wound, and if there has been an escape of blood or other substance into the peritoneal cavity, it should be also carefully removed. The wound in the uterus requires no attention, and is closed when the uterus contracts. If there is backwardness in contraction it may be kneaded and compressed until that is secure. These prerequisites to the closure being attended to, the sutures may be passed, an inch apart, from one end of the wound to the other. The needles should be inserted three quarters of an inch from the incision in the integuments, and include the lip of the wound down to the peritonæum. The silk threads may be tied over the wound so as to make an even interrupted suture. Adhesive straps and binder will finish the proceedings. The after-treatment should be conducted according to symptoms. If the shock is great or pain intense, opium is our great remedy,—in the former condition in small stimulating doses, in the latter, large and sedative quantities, as is recommended in puerperal peritonitis from other causes. The diet should not be meagre, but strictness in reference to rest should be enjoined, and the patient allowed cooling drinks, acidulated or not, according to the taste of patient.

Symphyseotomy has been a subject of condemnation for a long time, and has been so industriously and persistently denounced that I will add my voice by saying that it ought never to be thought of as an appropriate operation in any case. I cannot consume the time of my reader by asking him to read a description of it. There are, doubtless, cases in which post-mortem delivery, *per vaginam*, is required by the circumstances. When a post-mortem gastrotomy would be called for, and the soft parts are sufficiently dilatable to permit the introduction of the hand, this operation can be resorted to. I have had no experience that would enable me to speak authoritatively, but, in the nature of things, we might expect that muscular relaxation would be greater in articulo mortis, or immediately after death, than before. We are informed by authors that such is actually the case. Of course, in such cases, the delivery would be effected by turning and bringing down the feet. The reader is therefore referred to this method of delivery for details of action. *Hysterotomy per vaginam* would very much facilitate delivery in this manner, and could not be objected to as so serious in its consequences if the patient should turn out not to be dead. The incisions should be made by a blunt-pointed bistoury, one on either side of the cervix, an inch deep. This would not wound the vagina or penetrate the cavity of the peritonæum, and yet permit of very great dilatation.

DIFFICULT LABOR FROM COMPLICATIONS.

When labor is progressing without any apparent difficulty, and everything promises well, it is liable to be rendered difficult or dangerous by the occurrence of circumstances which could not be anticipated; and in other instances the condition of the powers that act in expulsion are perfect, the parts through which the fœtus is to pass, and the fœtus, correspond in being properly shaped and of correct dimensions with reference to each other, but some complicating contingency causes great anxiety if not disaster. These complicating circumstances are quite numerous—some extremely dangerous, while others are less grave in their nature. Probably the most common, and at the same time very serious, circumstance that occurs to render labor difficult and dangerous is hemorrhage. This effusion may occur at any time during gestation, and the conditions which cause it interrupt this process or complicate the delivery of the fœtus at any time. I have already spoken of it as a complication of abortion; it may complicate premature labor likewise, and labor at full term. When hemorrhage is very considerable during any period of pregnancy, it is quite likely to be accompanied by expulsion of the contents of the uterus. This act is indeed nature's method of cure. Separation of the placenta and rupture of the blood-vessels attaching it to the uterus are the source of uterine hemorrhage. The separation varies in degree, and with it the quantity of blood lost. If but a small portion be detached from the uterine wall the hemorrhage will be moderate, but if the placenta is largely and suddenly separated the effusion is very great, and may be fatal in a short time.

The dangers of copious hemorrhage from detachment of the placenta are greater the more advanced the time of gestation. The more terrible and fatal forms of hemorrhage occur at the time of and during labor. A singular and suddenly fatal case of hemorrhage was reported recently by Mr. Hyde Houghton to the London Obstetrical Society. The patient was forty-five years old; pregnant eight months. She was hanging some curtains, and, in reaching, lost her balance and fell to the floor; she commenced discharging blood from the vagina, and in forty minutes she had bled to death. At the post-mortem the uterus was found healthy, placenta attached, and os closed. The only trace of blood found was between the lips of the vagina. The source of the hemorrhage was not discovered by the examination, but in the discussion of the paper Dr. Greenhalgh suggested what would seem to be the only possible origin, viz.: the bursting of a varix.

General Symptoms of Hemorrhage.—When hemorrhage is sufficiently copious to produce an effect upon the system, the pulse becomes rapid, small, and weak; the face pale and covered with perspiration; there is noise in the ears, more or less dimness of vision, restlessness, nausea, sense of suffocation, and faintness. Often the patient rallies from this state of symptoms and feels much better, and becomes somewhat quiet and cheerful; but in a little while the symptoms return in an aggravated form, and syncope supervenes upon them. After this the patient arouses and returns to consciousness, but does not entirely recover her energies and comfort, and, after the lapse of a time, again faints. These syncopal paroxysms recur, becoming more profound each time, with vomiting, intense thirst, uncontrollable restlessness, wandering mind, fluttering, feeble, and finally lost pulse: in one of them she dies. The rapidity with which these phenomena succeed each other will vary with the rapidity of the flow, the general vigor of the patient, and the manner of her support by management. Sometimes but a few minutes will elapse before the patient is fatally exhausted; at other times twenty-four hours may be consumed in their progress and fatal termination. And if the hemorrhage ceases, or is checked by appropriate interference, the fainting spells become less frequent and profound until they do not return, but instead of them there is violent arterial excitement—the pulse is rapid, sharp, and small, having also but little strength; the heat of surface is increased, the head aches violently, and it is aggravated by slight noise; a sense of violent throbbing in the head is also often experienced, the bones ache, and the skin is dry. The patient is generally restless and wakeful, but sometimes stupid and comatose. The face is generally pale, but there is often a flush of redness in the cheeks, and rarely the whole countenance is flushed with a scarlet redness. This reaction subsides after a number of hours, sometimes quickly and completely, leaving the patient weak and exhausted; but sometimes it is continued in remittent paroxysms for a number of days, and the patient slowly recovers; or, instead of recovery, effusion of serum in the meningeal cavities increases the stupor and results in death; or, if not in death, prolonged debility, amounting to partial paralysis in some of the extremities, or very obstinate and almost uncontrollable neuralgia in some part of the body. Congestions of the liver and spleen, dyspepsia, obstinate constipation, and many other very serious chronic diseases, I have no doubt, have their origin in the profound effects produced upon the cerebro-spinal and sympathetic nervous centres by the terrible ordeal instituted by uterine hemorrhage. Generally, of course, in these cases of uterine hemorrhage the blood flows out in large quantities, flooding the clothing, bed, and person of the patient, and adds greatly to the alarm; but sometimes the blood, although extravasated, does not appear outside the genital organs. It is contained in the uterine cavity, and while the patient may die or be very greatly exhausted from loss of blood, it does not show itself externally. This form of hemorrhage has been very properly called concealed hemorrhage. There are, however, local symptoms in such cases which, if carefully considered, will aid us very materially in diagnosticating the case. If the patient is conscious, she experiences a sense of great distention and weight in the uterus, and irregularity of shape in the uterine tumor or globe, generally a swelling or protuberance standing out on the side or making the organ much more than ordinarily prominent in front. The diagnosis of concealed hemorrhage would be rendered pretty clear taking the history of the symptoms, the general conditions, and the local phenomena. The accident with which it might be confounded is rupture of the uterus; the same prostration, and something like the same irregularity in the abdominal rotundity might exist. There is quite a difference in the prominence on the uterus, as in the case of concealed hemorrhage the prominence would be smooth and semi-fluctuating, while, when rupture of the uterus has allowed the escape, more or less complete, of the fœtus, its extremities and other portions will be very easily distinguished through the abdominal walls. But we may have concealed hemorrhage after the expulsion of the fœtus, either before or after the placenta has been delivered. In this condition the mouth of the uterus becomes closed by a clot, or the membranes or placenta itself may occlude the uterus while it fills up with blood. In the case of concealed hemorrhage before the fœtus has been delivered, the blood is effused between the membrane and the uterine parietes, distending it and elevating the walls into the tumor that may be observed by examining the abdomen. Or, sometimes, the membranes give way at the place of effusion, and the blood is mixed with the liquor amnii, and for a time is contained in the cavity of the ovum; but soon the distended membranes give way and the liquor amnii and blood are poured out together in such quantities as to cause great alarm. When this happens the uterus contracts enough, ordinarily, to check the bleeding.

Treatment of Uterine Hemorrhage.—The indications for treatment are to moderate the force of the circulation, so that the blood will not be thrown out of the vessels so rapidly, and afford time for and facilitate the second indication, which is to induce coagulation in the mouths of the bleeding vessels. The third indication is to close the mouths and lessen the calibre of the uterine arteries. The means for moderating the force of the circulation are numerous. Bloodletting has been suggested and practised with advantage, apparently, in some cases, and yet I cannot recommend the remedy for general use; and when we remember that the hemorrhage is caused by ruptured vessels instead of great arterial action we cannot believe the measure often very useful. On the other hand, it increases the effects of loss of blood, and unless curative, is productive of great evil. The room should be darkened, kept free from noise and visitors, and, in fact, all stimulating circumstances. The patient should be kept perfectly quiet in the horizontal position, and all bodily, mental, and moral excitement avoided. Her drinks must be cold and entirely devoid of stimulating mixtures, and the diet should be of the same temperature and qualities. To these may be added cooling and sedative medicines, as ant. et pot. tart. in minute doses, say a sixteenth of a grain every hour in solution. This is an excellent medicine in moderate hemorrhage. The nitrate of potassa is also useful, given in large doses. For the same purpose digitalis, aconite, and veratrum may often be used. The local means for the hemorrhage are cold applications externally and internally: ice to the hypogastric region, introduced into the vagina, or ice-water as injections. The blood may be diverted from the uterus, and hence the circulation in it moderated very much, by ligating the limbs, both legs and arms, in such a way as to detain the blood in the superficial veins, and thus cut it off from the general circulation temporarily. An apparatus for protecting the surface of the limbs from atmospheric pressure, by being placed around them and exhausted of air, answers this purpose admirably. The general remedies for promoting coagulation of blood in the mouths of the bleeding vessels are the different astringents. The aromatic sul. acid, in mild forms of hemorrhage, will be found very useful and much less disagreeable. The acetate of lead and opium combined are very frequently used, especially in cases of a grave character. Matico, catechu, in fact, all the mineral and vegetable astringents, have been used and extolled for their efficacy in uterine hemorrhage. The acetate of lead, in doses of two grains with one of opium, every four hours, is probably the most efficient astringent that can be administered to the patient. The local means for promoting coagulation are more efficacious, but they more or less endanger the expulsion of the fœtus. The persul. iron, applied on lint to the os uteri, causes the blood that comes in contact with it to coagulate, and thus acts as a means of retaining the blood itself as a plug in the os uteri until that is nearer and in the mouths of the vessels to coagulate. The instant effects of the persul. iron and the plug may be counteracted by giving the patient opium enough to prevent the supervention of uterine action. The tampon, as it is called in French, in plain

English, plug, is a most efficacious remedy when adapted to the case. The intention of it is to stop the vagina, as a cork stops the neck of a bottle, so that no fluid may escape; and if it does not thus perfectly prevent the discharge of blood it fails of its main purpose. It is made of various materials and many different ways. The primitive, and an excellent mode of making the plug, is to insert small pellets of cotton wool or lint. The cotton should be rolled between the hands into pellets the size of a quail's egg, and thoroughly saturated with sweet oil or lard. One piece should be carried to the mouth of the uterus, and placed against it; others placed around it and below it are made to fill up all the vagina round about the cervix, and then perfectly pack and cram the rest of that tube to the vulva, each being pushed up against the other. A T bandage, supporting a compress over the vaginal orifice, will complete the dressing. Carefully thus applied, external hemorrhage is scarcely possible, and the plug may be relied upon with as much assurance as any surgical means in use. It is not sufficient to place a pocket handkerchief in the vagina, or even two or three. In fact, handkerchiefs do not make reliable plugs, and in cases of great importance it is better not to rely upon them. Some teachers advise us to use long strips of old muslin, oiling them well, and putting them in by beginning with one end, introducing them in short folds until the vagina is perfectly filled. Sponges are used, and are found to be very convenient. They may be impregnated with some astringent substance which adds to their efficacy. If they are compressed before being introduced they will act all the better for it. The colpeurynter or gum-elastic bag is the most convenient means out of which to make a vaginal plug. It is introduced empty, when it occupies a small space, placed against the os uteri, and inflated or filled with water. They are very reliable when well-watched. But the stop-cock and other portions too often leak a little, and permit the air or water to escape very slowly, thus making room for hemorrhage. And then again, the elastic, uniform, and constant pressure kept up by it on the vaginal wall in every direction causes it to dilate, until discharge may take place. Taking it altogether, the plug made out of cotton wool, or small pieces of old rags, well oiled and placed, is the best. If the different pieces are well applied until hemorrhage ceases, there is very slight danger of recurrence until it is removed. The plug acts as a dam to stop the flow. The blood thus stopped, after the cavity left between it and the bleeding vessels is filled, coagulates into a firm clot that is moulded to all the irregularities of its shape, and extends up into the mouths of the vessels, up to their first branches, and thoroughly prevents the discharge of any more. The plug must therefore have sufficient firmness to resist the force of arterial propulsion and force the blood back in the vessels. The plug ought not to be left in the vagina longer than twenty-four hours without removal, as the retained blood may, and generally does, begin to decompose and place the patient in danger of toxæmia, by absorption of putrid material. The vagina should be washed out, and if the conditions require it, a new plug may be immediately introduced. The plug generally stimulates the uterus to contraction and thus brings on labor. In certain cases this is desirable, but in many others we are deprived of its use on account of this effect. It may be dangerous to the mother by causing the hemorrhage to be concealed. It is absolutely necessary to its safe use to understand the kind of cases to which it is applicable, and I think this is about a correct mention of them. It is applicable to all cases of uterine hemorrhage where the life of the fœtus is abandoned in the urgent necessity of saving that of the mother, or it has perished, if gestation has not advanced beyond the fourth month. It is thus universally applicable before this time, because the uterus is not capable of being distended large enough to hold a fatal amount of blood. It is never applicable to the empty uterus at term, because that organ is easily distended by the blood effused by it in a state of inertia. In fact, when the uterus is lax enough in its contractions to bleed freely, it is incapable of resisting the slightest distending power, and in using the plug in such cases we merely convert the case into concealed hemorrhage. The plug must not be used in any cases at term or near it, except central implantation of the placenta over the cervix. The foregoing means will often suffice to stop the hemorrhage, and after such relief the patient may progress in gestation, if she has not arrived at term, or in her labor, if this has commenced. In many instances, however, they are merely temporary, enabling us to gain time until permanent relief comes from a fulfilment of the third indication. Nature, in the structure of the uterus, has provided living organic ligatures by which to ligate the uterine arteries; in cases of the great extremity of serious uterine hemorrhage. The arteries enter the sides of the uterus between the layers of the broad ligaments, and after penetrating its tissues wind around in channels between the muscular fibres to the different parts of the organ, going up to the body and fundus, down to the cervix, and across to the anterior and posterior walls, giving off branches in their route that penetrate the numerous membranes, some of which become the placental arteries. These vessels, therefore, traverse the uterine tissue in a circuitous manner before terminating on the internal surface. They are also very tortuous in their course, becoming decidedly so before labor. In many places they are surrounded by vortices of fibres, and placed at points of decussation of the fibres of the different muscular layers in angles and curves, so that the uterus, in contracting even to a small extent, compresses them in many places in their course, and as the fibres of the different layers draw in different directions, the vessels are rendered still more crooked in their course, and at the curves sharp angles are formed by contraction. In uterine contractions, therefore, the arteries are lessened in their calibre throughout their whole course, allowing a smaller amount of blood to enter and traverse them, and on account of the zigzag sharp curves in them the force of the *vis a tergo* of the heart and arteries is broken, while at the mucous or placental extremity their mouths are also very much narrowed, and by much contraction many of them are literally closed. All these processes of compression and curvation are the more effectual because the arterial tissues in the substance of the uterus are more delicate and compressible. This natural conservative influence, although incidental to the process of expulsion, is all that prevents every woman who is delivered of a child from bleeding to death. It is quite certain that if the placenta could be wholly detached from the surface of the uterus, while that organ remained expanded to its fullest extent at the end of gestation, enough blood would be lost in fifteen minutes to produce fatal results. Contraction of the uterus, then, is the object of all our efforts when the other means fail or are deemed inadequate. The means used to secure uterine contraction operate in two different ways. One kind stimulates the uterine muscular fibres, either by direct contact or through the medium of the nervous system, to contraction, and thus causes an expulsion of the ovum; while the other, in removing the contents of the organ, permits the elastic contraction of the fibres to diminish the size of the uterus, and thus lessen the calibre of the vessels. Of the former kind, pressure and kneading the uterus through the abdominal walls, contact of the fingers and hand with the inside of the uterus, and all similar direct irritating measures constitute a division of this class; while ergot, borax, and medicines that act to cause contraction of the uterus is another. There is another class of influences less energetic, but still valuable under certain circumstances, called reflex influences, when vaginal, rectal, and mammary irritation cause the uterine fibres to contract. This kind of agency was first distinctly and systematically enunciated by Dr. Tyler Smith, although the facts, many of them, are old. Those for *permitting* the contraction of the uterine fibres are: puncturing the membranes and evacuating the liquor amnii, delivery of the fœtus, and finally removal of the placenta or coagula that may fill the uterus after this last has been expelled. After the uterus has been emptied, another means of diminishing the force of the uterine circulation is to compress the aorta above its bifurcation, by pressing it against the spinal column. When speaking of the effect of uterine contraction, it was stated that the fibres of the uterus compressed the uterine arteries, on account of their contractions. Expansion of the os and cervix at the time of labor produces a similar effect on the arteries of the neck. Dilatation of the cervix is a mixture of fibrous contraction and relaxation. The fibres running longitudinally from the os uteri toward the fundus contract, while the transverse, or those that encircle the neck, are relaxed and lengthened. When the placenta is implanted on the cervix, the expansion of the cervix separates the placenta as effectually as contraction separates it from the fundus or body of the organ and compresses the vessels. I shall allude to this more in detail after a while. The time comes in excessive hemorrhage, either during the flow or afterward, when the effects or consequences will demand our urgent attention. Excessive prostration, amounting to recurrent or protracted syncope, must be relieved or the patient will soon die. It must be remembered that syncope is the result of a withdrawal of blood from the brain, and means that are calculated to restore it in good quantities will relieve the prostration. Two valuable measures may be immediately resorted to, and can be brought to bear upon the case so readily that they are always available. The first is position. The head must be placed very much below the body, and the feet and legs very much elevated. I have sometimes taken the patient by the shoulders, and turning her round, brought the head and chest off the bed and placed them on a chair or low stool, much below the level of the bed, while an assistant placed a chair on the bed, inverted, and raised her feet and legs high enough to rest upon it. An inclined plane from the feet to the head is thus made, which permits the blood to flow easily into the brain and stimulate it into action, keeping up its vitality until the flow of blood can be stanched, and by other means the force of the circulation restored. In addition to this great change of posture, a tourniquet may be placed on each thigh, and the flow of blood through the femoral arteries for a time stopped or very much diminished. In this way a large amount of blood will be sent into the cerebral vessels, and the brain sustained in its action for a time and until we may resort to other measures. In applying the tourniquet the venous circulation ought not to be impeded by the strap, but the flow of blood upward should be unimpeded. While the bleeding is in progress stimulants should not be used, as they quicken the circulation and cause further effusion; but so soon as contraction has secured the bleeding vessels, they are valuable in hurrying the reaction which is indispensable to the restoration of expended energies. We should regard this tumultuous arterial reaction as necessary to inject a sufficient supply of impoverished blood into the brain to sustain the nervous system until absorption fills the vascular system sufficiently to keep up distention enough to fill the brain with blood. A large quantity of nutritious fluids taken as nourishment will promote this, and also the repletion of the blood-vessels. Brandy, carb. ammonia, and laudanum are the best stimulants we can command. When reaction is established the stimulants proper may be withdrawn, but the anodyne may be continued, in order to moderate the nervous symptoms that accompany such action. Perfect quiet in a dark noiseless room, with no one but a trusty nurse with her, are also important accompaniments to the treatment. In extreme cases transfusion of blood is advised and practised by most authors, and will be available in some cases. This means is not generally practicable unless in lying-in institutions, as the cases occur unexpectedly, take the attendant on surprise, and find him without preparation for an operation of so much delicacy and difficulty. Hemorrhage occurring during the latter weeks of pregnancy, at term, and during labor, before the expulsion of the fœtus, is very much modified by the position of the placenta. When the placenta is attached to the fundus on the sides of the body of the uterus the separation is apt to be less in extent, and is not increased by the expulsive efforts of the uterus, but the continued contraction of the organ has a strong tendency to check the hemorrhage. The separation of the placenta in such cases is the result of accidental circumstances not connected necessarily with the labor, as falls, jerks, blows, etc. From this last fact Dr. Rigby the elder named the hemorrhage occurring under these circumstances "accidental hemorrhage." When the placenta is situated so that it is implanted upon the cervix either by one edge reaching to the os uteri, or over it, or when the centre of the placenta corresponds with the os uteri, it is impossible for dilatation to proceed without the placenta being separated to a greater or less extent. In fact, every efficient pain tears away some of the placenta and renews the hemorrhage. Hemorrhage thus produced, according to the nomenclature of Dr. Rigby, is unavoidable hemorrhage. The term placenta prævia is also applied to the class of cases where the placenta is thus situated. The distinction made by Dr. Rigby is so marked and obvious as to strike us forcibly at once, and it is exceedingly valuable as a guide for treatment, as I shall have occasion soon to show.

Accidental hemorrhage before labor is caused by a blow on the uterus over the placenta, pressure in the same place, fall or slips, in fact any circumstance that causes the fibres suddenly and considerably to contract at the site of the placenta. This contraction of the fibres, effected by local stimulation, when extensive, causes the uterine surface to slide over the placental surface and ruptures the blood-vessels at that point of attachment; blood is effused, and if in the centre of the two surfaces it does not find its way out, a clot is formed, filling up the cavity caused by the rupture, and, plugging up the mouths of the bleeding arteries, the hemorrhage is stayed; but if the edge of the placenta is the seat of the separation, the blood finds its way between the membranes and the surface of the uterus, and burrows for itself a channel to the mouth of the uterus and there escapes. It is not probable that any violence applied to the uterus, not sufficient to rupture its substance, would cause separation of the placenta by its direct action; but a gentle stroke, or suddenly applied force, may cause the uterine fibres to contract suddenly, powerfully, and extensively in the immediate neighborhood of its application, and, if over the placenta, bring about separation and consequent hemorrhage. We cannot always decide by symptoms merely as to whether a case is accidental hemorrhage or not. The history will aid us very materially: the accident that caused it is generally appreciated and remembered by the patient. If it is before labor has commenced, it continues steadily from hour to hour, and ceases slowly, or by the influence of remedies. If labor has begun, or begins soon after it begins, the flow continues to show itself between pains, but ceases during a pain. The reason of the intermittence of the flow is, that when the uterus contracts the membranes are pressed strongly down into the lower part of the uterus, and for the time of the pain compresses the sides of the channel through which the blood flows, and prevents its escape; but when the pain passes off, and the fibres relax, the channel is opened, and the blood escapes. If any circumstance occurs to obscure this symptom, or we have any reason to doubt the correctness of its indication, an examination with the finger will be conclusive, as by it we shall feel the smooth surface of the membranes in the cervical opening.

The prognosis, in a general way, is not serious, as the hemorrhage is comparatively easily managed. It is much less dangerous than the unavoidable form.

The general treatment of this form of hemorrhage has been detailed in the foregoing pages, but if this is not sufficient, and the hemorrhage is sufficient to threaten the safety of the woman, the membranes must be ruptured, to allow the uterus to contract upon the bleeding vessels. As the evacuation of the liquor amnii necessarily interrupts gestation and results in expulsion of the fœtus, this measure must not be resorted to until we are assured of the inefficacy of the general treatment, and the danger of the woman. In labor the case is very different; gestation is already at an end, and it is proper that the uterus be emptied of all its contents; hence we ought not to wait for any other assurance than that the hemorrhage will continue without it.

The measure should be adopted early, when the hemorrhage requires it; we need not wait for the dilatation of the os uteri. The rupture of the membranes before labor has begun, or before the os uteri is open, may be effected best, perhaps, with a female catheter. Guided by the forefinger of the left hand, it may be passed inside the uterus through the membranes. The catheter may be retained in the cervix until most of the water passes through it, as it is desirable to have it flow off as quickly as possible. Drawing off two or three pints of the contents of the uterus allows it to diminish very decidedly in size, and the action of the fibres in this contraction, as has been already explained, is to compress the vessels. It is very rarely the case that rupture of the membranes does not at once check the hemorrhage, and it may be regarded as quite sure in its effects. If, however, it should fail, the child should be delivered by turning, forceps, or otherwise, as the conditions require and justify. When the presentation is correct, the os uteri dilated or dilatable, the ergot may be regarded as an invaluable remedy. Other means of prompting the uterus to action, as external friction upon the abdomen, kneading, etc., are applicable and proper.

Unavoidable hemorrhage, placenta prævia, or placental presentation.—All these terms are used to express the same condition. In these cases, as before stated, the placenta is situated at or over the cervix uteri. When situated so that the edge comes to, but does not cover the mouth of the womb, it is much more favorable, so far as the prognosis is concerned, as the hemorrhage is not usually so copious, and, in fact, sometimes does not occur; for, as explained by Scanzoni, the portion of the cervical circle not occupied by the placenta may dilate sufficiently to permit the head to pass down until pressing upon the edge of the placenta, so as to close its vessels and prevent the blood from escaping, when separation becomes inevitable. But this must be very rare. When extending more over the cervix, the development of that portion of the uterus being a species of dilatation as well as hypertrophy, bleeding is induced during the last month of pregnancy. This is especially true of cases where the placenta happens to be implanted centrally over the cervix. In the last four or five weeks of pregnancy the patient experiences, at intervals, more or less flow of blood from the vagina. When sitting quietly reading, sewing, or otherwise occupied, or in bed even, while asleep, a sudden gush of blood takes place, but it does not continue but a little while. She loses only an ounce or two, and this flow is followed for an hour or two with a little bloody serum, and leaves the patient free from apprehension or danger, but perplexed as to its cause. In the course of several days more the sanguineous discharge is repeated, perhaps rather more copious than the first, or it may be not, even less so. This loss of blood is generally experienced several times during the last month of pregnancy. The explanation has already been given; by stretching of the fibres one or more small blood-vessels are ruptured, and being immediately at the mouth of the uterus, the blood at once escapes: the vessels being small and retracting, the bloody discharge soon ceases. When labor begins, the os uteri begins to dilate; the longitudinal fibres generally begin to act first; it shortens the longitudinal extent of the cervix, the transverse fibres relax, and the ring of the mouth of the uterus increases in size; a slight separation and rupture of vessels occur, followed by hemorrhage, slight at first. This is apt to be, although it is not always, the first symptom of labor. As the dilatation increases, the loss of blood becomes greater, indeed profuse. This state of things continues until the cervix is dilated considerably, when the head is pressed strongly down upon the placenta, and the hemorrhage grows less in quantity, and as labor advances still further, becomes quite trifling in amount, until the placenta is wholly detached and thrown out of the organs before the head, which follows, and the labor terminates favorably. When the pains are active, propulsive, and strong, pelvis roomy, and the soft parts not too rigid, this I think is not an unfrequent termination of the case. Instead of the placenta being driven before the head, it is sometimes separated at one side, and the head passes it without complete separation. It would be interesting, in a practical point of view, to know how often these cases of unavoidable hemorrhage would terminate spontaneously and favorably. I have met with two instances where the child had been expelled before I arrived, the female attendant assuring me in one that the placenta was expelled before the fœtus. In the other the placenta was still attached by one-half, or perhaps a little more, to the one side of the cervix uteri. Both women were affected seriously by the loss of blood. The one in which the placenta was expelled had been in labor six hours, and had fainted several times; but I think would not have done so but for the mistaken idea of keeping the head and shoulders elevated. The other had a more rapid labor. She was awakened by hemorrhage in the night, about two o'clock pains quite active and efficient came on, and in two hours she was delivered. Both children were dead. Now there is a consideration in connection with these cases that was brought out by Dr. Barnes, of London, in the *Lancet* for January, 1858, that must not be lost sight of, in order to understand the *modus in quo* of spontaneous and favorable termination of cases of placenta prævia. As the longitudinal fibres contract, and the transverse relax, making traction upon the trunks and branches of arteries about the cervix they are drawn in different directions from their original course, and by pulling in transverse direction with reference to each other, these vessels are made subject to varied pressure by extremely sharp angles and in many places; being closed by the crossing of the transverse and longitudinal system of fibres, and the greater the amount of dilatation, the more effectually are the retardation and arrest of the current of blood toward the placenta accomplished. Dilatation of the cervix is therefore not only attended with danger, but it is attended with circumstances of safety; for while each pain is attended with an effusion of blood, the contraction of the longitudinal fibres and relaxation of the circular, indicated by the pain, serve to close the bleeding vessels, and the amount lost will be very much modified by this last fact. After the dilatation has proceeded to a certain extent, this circumstance renders the further separation of the placenta of no consequence, so far as the giving rise to hemorrhage is concerned.

The diagnosis of placenta prævia is made out by the history of the latter weeks of gestation, the frequent occurrence of bleeding during that time, and the mode of its occurrence during labor. The hemorrhage during labor is increased during the pain in placenta prævia; in accidental hemorrhage between the pains. But we may demonstrate it by physical examination. The finger will fail to feel the smooth membranes, but come in contact with the fleshy irregular substance of the placenta. When that portion that has been separated from the uterine surface is felt, the rough cordy sensation it imparts is characteristic and cannot be mistaken for a clot of blood, which is smooth, soft, and easily penetrated by the finger.

The *prognosis* of placenta prævia is very grave indeed, as many patients die, with the best management we can devise. The fatality to the fœtus is greater than to the woman, although the infant is sometimes born alive. The less completely the placenta is implanted over the os uteri the less the danger, and the converse. Many cases of partial placenta prævia terminate favorably, and there are but few that may not be conducted safely through if properly managed.

Treatment.—The loss of blood being the danger, everything in the treatment should be made to bear upon the case with the great consideration of preventing the loss of blood. Sufficient separation of the placenta is not likely to take place before the commencement of labor to endanger the life of the patient, and all we will generally be obliged to do before the dilatation of labor begins, will be to institute the general treatment directed heretofore. But when labor does begin, all our efforts must be promptly put forth to save blood. Often a large amount of blood is lost before the arrival of the accoucheur. This, of course, is unavoidable, if he has not been aware of the nature of the pregnancy. If, however, the patient has been the subject of suspicious hemorrhages, and the practitioner has become aware of her condition, much may be done to prevent the loss of blood, if indeed it may not be almost entirely avoided. Some intelligent nurse or relative should be in constant attendance upon the patient day and night when she is near the time of labor, and instructed in the use of the colpeurynter, and directed, so soon as hemorrhage and pain, or hemorrhage without pain commences, to immediately introduce that instrument and inflate it, or fill it with water, until the hemorrhage ceases, and at once send for the medical attendant. If the nurse distend and keep distended to a sufficient extent this elastic bag to stop the bleeding, the patient can wait for the physician. The directions for its use should be plain, explicit, and emphatic, and should be intrusted to no one in whose qualities we cannot place implicit confidence. The ease and readiness with which this instrument can be applied by the unskilled recommends it—for this condition of things—as extremely valuable. The physician having arrived, if, as I have supposed, he has acquainted himself with the nature of the case, he should continue the plug. Or if he is called for the first time after labor has begun, it is his duty to learn the condition of things precisely, and if it is a central implantation of the placenta, he should at once close the mouths of the bleeding vessels, and promote a speedy expulsion of the contents of the uterus. Plugging is a sufficient means for the purpose of stopping the hemorrhage, and by the presence of the tampon in the vagina promotes uterine contraction. After plugging, if the uterus is acting vigorously and the hemorrhage checked we can await the result of its action, leaving the plug to be expelled in advance of the fœtus. It is not only useless, but wrong, to remove the plug until expelled from the vagina in such cases. If the uterus is not acting vigorously we should administer ergot. Whatever the condition of things may be, ergot is right in these cases; if it does not cause increase of pains it will increase the silent or elastic contraction of the fibres and thus check the hemorrhage, and if it is efficacious, the action of longitudinal fibre will draw open the os uteri, and the transverse fibre will relax, and thus hemorrhage will be controlled. It is a part of the action of ergot to open the mouth of the uterus, as well as to lessen the cavity of the body. It does not cause contraction of the circular fibres of the cervix, it rather relaxes them. The manner of administering the ergot has been sufficiently detailed under the head of tedious labor. These means, especially the plug, are applicable to the early steps of labor without reference to dilatation. If they are early and thoroughly tried, they will more frequently succeed than any other plan of treatment. It is necessary to be very careful about the plug in order to obtain its best effects. It should fill the vagina perfectly and firmly. The uterus may be moved to energetic action by kneading and grasping it through the abdominal walls also. The plug is also applicable to cases where the loss of blood is very great, the patient so much prostrated as to make her incapable of enduring the fatigue and loss of blood from turning. After checking the bleeding by the plug, stimulants, restoratives, and ergot should be administered, and every effort made to encourage and enable nature to expel the contents of the uterus. If, however, the uterus is incapable of finishing the process, we shall be under the necessity of resorting to artificial delivery. The teachings of the profession of the present day, I think, inculcate too much interference in placenta prævia. I am free to say that I think it is over-treated. We take the whole matter in our own hands. If we have a case of placental presentation, we commence to dilate the os uteri, if it is not dilated already, and as soon as it is dilated, or dilatable, we proceed to deliver, by forceps if we can, if not, by turning; as a rule, by the latter operation. If the hemorrhage has not been considerable, we turn for fear of bleeding, as bleeding is the rule. Now I think this is all wrong. We should stop the hemorrhage if it has begun, prevent it if it has not begun, and terminate the labor by interference only because the powers of nature are insufficient. I believe that this unnecessary interference by introducing the hand and turning has had more victims than unaided nature would have made in placenta prævia. The introduction of the hand necessitates a fearful loss of blood in spite of the most dextrous management; it causes so much irritation and abrasions as to give rise to subsequent inflammation.

Dr. Tyler Smith expresses the general opinion of the profession when he says, "Turning is the operation for placenta prævia." While I most emphatically dissent from this proposition, and do not believe turning necessary or justifiable as a general thing, I feel called upon to give the rules applicable to, and the circumstances under which, turning is generally practised. The practitioner is to commence his operation so soon as the os uteri is dilated enough to permit the hand to pass, or soft enough to permit the dilatation of it by the hand. When the mouth of the uterus *is not* open, we are directed to use the dilator of Dr. Barnes, the action of which has been already described, both as a plug to prevent bleeding, and open it until the hand may be introduced and turning effected. Others direct us to use the ordinary tampon and wait for dilatation, and then turn and deliver. The hand is introduced into the uterus by the side of the placenta—selecting, when possible to ascertain, the side where the smallest amount of attachment exists—separating it from the uterus so as to permit the hand to pass, the feet of the child seized and brought down through the place of separation effected by the hand into the pelvis, until the breech is engaged in the cervix, where it will press upon the divided vessels, and, what is still better, maintain a large dilatation of the cervix and thus stop the bleeding. Delivery is then effected so soon as the uterus can be made to act fast enough to keep up proper contraction. The contraction is generally good, and consequently the delivery may be done pretty quickly. Some operators pass their hand through the centre of the placenta by rupturing an opening through it. I should prefer the plan of separating a portion of the placenta at the side to this, as being easier effected and less likely to detach the whole organ. Sir James Y. Simpson recommends the entire separation of the placenta, and its removal from the cervix, as the best method of stopping the hemorrhage; and a number of cases are reported by him and others that have been successful in saving the mother. The hand is introduced into the vagina, the middle and forefinger passed through the os uteri inserted between the placenta and uterus, and swept around the circle of the cervix between them, until the organ is detached and removed. Or, after passing the fingers up between the uterus and placenta, far enough to pass beyond the edge, it is seized, brought through the mouth of the uterus, and traction made until the whole of it is separated and removed. After the separation the bleeding is generally very much moderated; the presenting part of the fœtus settles down on the surface whence it has been detached, and by pressing upon it still further checks the flow. If the uterus acts efficiently, labor may soon be terminated; if not, ergot can be given to cause it to do so, or the forceps applied, and delivery effected by them. Dr. Barnes recommends the detachment of one side, leaving the other as a medium of support to the child, and assures us that the hemorrhage will cease. When the placenta is only partially implanted over the cervix, so that the edge of it may be felt as well as the membranes, the practice is to rupture the membranes and allow the escape of the liquor amnii. The same thing takes places that checks the flooding in accidental hemorrhage: compression of the blood-vessels on account of contraction of the uterine fibres, and also the presenting part presses the edge of the placenta against the side of the uterus, and closes the vessels in that also. This plan of evacuation of the liquor amnii is urged by some writers as sufficient for central implantation of the placenta. When the placenta is thus situated, and we cannot reach the membranes with our finger, a female catheter is pushed up through the placenta and allowed to remain until the liquor amnii flows through it. It is better to leave the catheter in place for some time, because the opening in the placenta closes, so that but very little will pass off after it is taken away. Dr. Henry Miller favors this method of treating placenta prævia, and adds the plug after the waters have been evacuated. A circumstance which sometimes is said to embarrass our operations through the cervix, either for turning or separation of the placenta, is an obstinately rigid os uteri that will not permit the passage of the hand or fingers. I have not met with this kind of a case, and suppose, while the os uteri is so close and rigid as not to dilate somewhat easily, there cannot well be sufficient separation of the placenta to cause much hemorrhage. In such cases the plug ought to be used until that rigidity has all passed away; or we can, if there is sufficient reason for hurry, dilate the cervix with Dr. Barnes' dilators. I cannot dismiss the subject of placenta prævia without saying again, that I think the most cases are over-treated; that we do not rely sufficiently upon the resources of nature; that our great object is to check and prevent hemorrhage, and we are not to deliver if we can stanch the blood without. We should rely more on the plug, especially as we have a form of it that may be applied by any person of ordinary intelligence. The patient and friends should be carefully instructed in the necessity and use of the air-bag, so that the loss of blood may be prevented until we arrive, and then we should make it the main object to keep the plug well applied until expelled. We sometimes have cross presentations in connection with placenta prævia. In such cases turning is necessary because of the position, and not of the hemorrhage. Our diagnosis and change of position may be greatly facilitated by external examination and manipulation; but, if necessary, we must pass the hand into the uterus.

A class of cases occur in which it is very proper to induce premature labor, as when, for instance, for many weeks the bleeding has been continued, or is likely to be continued until the patient is much exhausted. The danger to the mother is very much less, as also to the child, if we deliver before the continuance of the bleeding has done much damage. Dr. Greenhalgh, Physician Accoucheur to St. Bartholomew's Hospital, London, advocates the induction of premature labor as a rule. I copy the conclusion of a paper read by him before the London Obstetrical Society, June 1st, 1864, as illustrative of his views on the subject:—

"Having placed before you, somewhat *in extenso*, the results of my own limited experience and the large impartially collected statistics of Dr. Read, in a tabulated form, as far as they have a bearing upon the plan of treatment about to be proposed in cases of placenta prævia, what, we may now ask, are the important practical points to be deducted therefrom?

1. That nature, unaided, every now and then, overcomes this accident with safety, both to mother and child.

2. By what means such a happy result is effected.

3. That although nature alone is equal in many cases to the emergency, yet such a result must be regarded as strictly exceptional, and as by no means establishing a rule for practice, but simply as indicating the course to be followed in the application of art.

We are further taught the following, and perhaps not less important, facts :—

1. That placenta prævia, complete or partial, may happen at any age.

2. That it may occur in a first or any subsequent pregnancy.

3. That it may exist at any period of utero-gestation from four months up to the full term.

4. That spontaneous premature labor is the rule, and not the exception, in these cases.

5. That a patient may be from a few minutes to many hours or even days in labor, with this complication.

6. That in proportion as pregnancy has advanced, so is usually the severity of the hemorrhage.

7. That the patient may have one only or many attacks of flooding, constant or periodic, slight or severe, extending over a few minutes, hours, days, weeks, and even months.

8. That the danger to mother and child is in relation either to the amount of blood lost, the suddenness of its flow, or the lengthened period over which such loss extends.

9. That notwithstanding the patient may be reduced to an alarming degree by loss of blood, the os uteri and external parts may continue rigid and preclude delivery.

10. That in proportion to the amount of exhaustion, so is the danger to mother and child from any subsequent manual or instrumental interference.

11. That neither rupture of the membranes, the natural or artificial separation of a part or whole of the placenta, nor ergot can be relied upon, singly or conjoined, to arrest the hemorrhage in these cases.

12. But occasionally so alarming has been the prostration that no attempt could be safely made to effect delivery.

13. That although turning, *per se*, cannot be regarded as a dan-

gerous operation, yet when undertaken in cases where the patient had been much reduced it proved fatal in 131 out of 512, one in less than four (Read), not to mention the amount of fœtal mortality.

14. That the effect of the plug was to arrest hemorrhage, to excite labor-pains, and to promote dilatation of the os uteri and external parts.

15. That the ergot given in repeated doses occasioned uterine contractions, and thus favored the descent of the presenting part and prevented post-partum hemorrhage.

Having, I trust, clearly placed before you the data from which these conclusions are drawn, and convinced you, I further hope, of their correctness, it now remains for us to consider what are the results to mother and child from the induction of artificial premature labor. From large statistical inquiries it would appear that less than 1 mother in 53 cases lost her life after this procedure; and when we bear in mind that in many of the recorded cases this operation was adopted in some on account of great pelvic distortion, and in others where the patient's condition was most unsatisfactory, the mortality may even be still further reduced, and especially where timely had recourse to, in the cases under discussion. Moreover, two-thirds of the children were saved by this proceeding, although, in many cases, considerable mechanical impediments existed to their passage through the pelvis, which, in cases of placenta prævia, are not likely frequently to be encountered.

It has always appeared to me that, in cases of difficulty or danger, and more especially where there are great differences of opinion upon important points of theory and practice, it is the paramount duty of the practitioner of medicine (I use this term in its largest sense), first, to inquire how and by what means nature endeavors to surmount her difficulties; and, secondly, whether, when succeeding, she overcomes them more successfully than by the interference of art.

Let us inquire how far this principle is applicable to the cases at present under consideration.

In order that I may be clearly understood, let me picture a model case of placenta prævia terminated by the unaided efforts, and then point out to you the plan which appears to me most consonant with nature's workings, and, finally, place before you the several means by which such indications may easily and safely be carried out.

Suppose, then, that a woman of fair average strength be taken in labor, the uterus vigorously and rapidly contracting, the os uteri speedily dilating, accompanied by a moderate loss of blood, the child of average size and in the normal position, whether the placenta be, in part or wholly, over the os uteri, or even if expelled a short time before the birth of the child, the case may, and in all probability will, terminate safely both to the mother and her offspring. It is rare that we meet with such a combination of circumstances; still, they every now and then do occur, and ought to teach us most valuable lessons.

From the foregoing facts, and these indications from nature, I conceive that I am fully justified in recommending the following line of practice:—That in any given case of hemorrhage due to placenta prævia, occurring after seven and a half months of utero-gestation, when the child is viable, it is expedient, both for the safety of mother and child, to expedite labor—unless the condition of the patient from exhaustion be such as to preclude this step, and, if so, then as soon as possible after she has recovered from the shock—by every means in our power; that, in so doing, we should arouse the uterus to vigorous action; and while, on the one hand, we take due precaution to arrest all external flow of blood from the vagina, we should, on the other, adopt such means as will effectually prevent any accumulation of blood in the cavity of the uterus, at the same time that we endeavor to effect a gradual dilatation of the parts.

These ends are to be attained by means of a vaginal plug, an elastic abdominal bandage, and ergot of rye, with the occasional additional aid of stimulating enemas, frictions over the abdomen, and sometimes rupture of the membranes; turning only in cases of presentations of the upper extremities; the forceps where, from inefficient action of the uterus, or slight mechanical impediments, arrest takes place in the passage of the head through the pelvis; and craniotomy in more serious cases of disparagement in size between the presenting part and pelvis.

The plug; its construction and use.—Although a silk handkerchief, pieces of sponge, cotton-wool, and inflated india-rubber balls, have been used to plug the vagina, experience has convinced me that they cannot be depended upon to arrest the hemorrhage. I have, therefore, much pleasure in introducing to your notice a plug which is easy of introduction, comfortable to the patient, and most efficacious in its results.

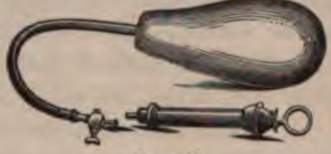


FIG. 143.

It consists of an oblong india-rubber ball, larger at its upper than lower extremity, which terminates in a tube, closed by a stop-cock. In its construction, having been inflated, it is covered by spongio-piline, the impermeable surface being in contact with the ball. When collapsed, it is fully introduced into the vagina, and subsequently distended with air by means of a syringe, until it thoroughly fills that canal. A small piece of grease may be smeared on its upper part, so as to facilitate its introduction. It should never be allowed to remain in the vagina more than twenty-four hours, and, when withdrawn, that canal should be freely syringed out with a lotion of Condy's fluid, so as to remove all acrid and offensive secretions. The plug must then be thoroughly washed and soaked in a similar fluid, previous to its reapplication, if required, or, what is better, a fresh one may be used. It should be retained in its place by a pad placed over the vulva, and a silk handkerchief between the legs, secured to the bandage before and behind. I always keep three sizes for the vagina, of various dimensions.

The plug arrests all hemorrhage from the vagina; it acts as a local irritant, occasioning labor-pains, and, by dilating the vagina, greatly facilitates the passage of the child. It may be retained in the vagina until there are evidences of more or less pressure upon it, when either a little air may be permitted to escape, or it may be extracted or left to be expelled by the natural efforts, care being taken that it is not acting as a mechanical impediment to the passage of the child.

The bandage, its construction and use.—Although a jack-towel, shawl, or the ordinary abdominal bandage, answers tolerably well, still I find the bandage constructed at my suggestion, by Mr. Huxley, far more easy of adjustment, cooler, and more comfortable to the patient. I submit this bandage to your inspection, which you will perceive is so made as to fit any person,

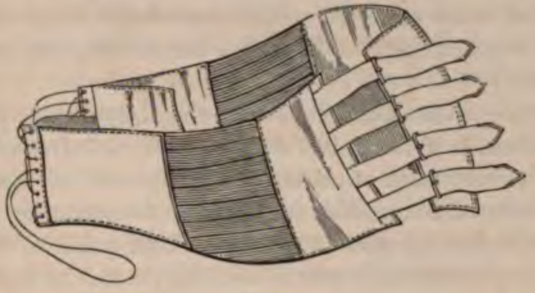


FIG. 144.

whether stout or thin. It should be applied so as to make very firm pressure over the uterus, and thus prevent the distention of that viscus by blood. It should be tightened from time to time, so as to favor uterine contraction. It is prevented from riding up by the silk handkerchief placed between the limbs.

Air-pad.—In event of further pressure being needed, especially after the birth of the child, the flat circular pad, with a hole

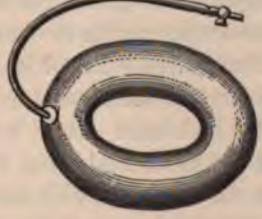


FIG. 145.

in the centre, may be placed under the bandage, and then filled either with air or ice-water to the requisite degree.

Ergot of rye.—When the plug and bandage are properly adjusted, repeated doses of infused ergot with tincture of nux vomica may be given, so as to excite or increase uterine action. I have found it serviceable to give a dose just before or immediately after the birth of the fœtus, and in those who are much enfeebled I usually add about a table-spoonful of brandy to one or more doses.

Rupture of the membranes.—Every now and then, especially when the labor is premature, the membranes will be found very tough, when it may be desirable, in order to expedite labor-pains and allow of more efficient contraction of the uterus, to rupture them. A notched finger-nail, or guarded stilette, may be used for this purpose.

Stimulating enemas, frictions over the abdomen, or galvanism, are valuable aids if the pains are feeble or of infrequent occurrence. The best form of enema is a compound of decoction of aloes, tincture of nux vomica and spirits of turpentine, in gruel.

I may add that the patient should be kept quiet, in the recumbent posture, comfortably warm, and supported by light articles of nutriment, and stimulants if required. The state of the bladder and bowels should be carefully attended to. Bleeding should never be had recourse to unless the state of the general system demand its use, and then with extreme caution."

I here subjoin a case reported by Dr. Greenhalgh as illustrating the kind of treatment he recommends, as well as some of the arguments by which he sustains the practice:—

"*Partial placenta prævia; severe hemorrhage; spongio-piline plug; induction of artificial premature labor; safe delivery of mother and child.*—Mrs. S., æt. 34, mother of three children, the last eighteen months ago; labors good, but indifferent recoveries, so weak that she has never been able to suckle her children; was about seven and a half months advanced in her fourth pregnancy. I was informed on my arrival that, about half an hour ago, while lying quiet in bed, she had been seized with a sense of discomfort and fulness about the lower abdomen, followed by a copious 'gush' of blood from the vagina, which had occasioned her and those about her considerable alarm. I found her blanched, pulse feeble and very rapid, surface cold; she trembled from head to foot, and expressed a dread that if she had another such loss she should lose her life.

I soothed her as well as I could, and remained in the house some hours, administering frequently, and in small quantities, brandy, milk and egg, laudanum, and ether, until she had fairly rallied. I then made a careful examination, which convinced me that the child was alive, the head depending, and the placenta wholly or in part stretched over the os uteri. I requested that she should be kept religiously quiet, that cold beef tea, milk, and brandy should be given frequently, and that she should not, under any circumstances, raise her head from the pillow, stating that I would not be answerable for the consequences if she disobeyed my instructions. As there was no pain or hemorrhage, and as she had not completed the full term of pregnancy, I did not deem it necessary to plug the vagina. Before leaving the house I informed her husband of the nature of the case, the probable return of the flooding, and the possible danger of a fatal loss of blood before medical aid could be summoned. His agony of mind at learning my opinion it would be impossible to depict. I shall never forget his words: 'Is there nothing that science can suggest in such a case? Oh, bitter thought! that some day I may leave my dear wife well and happy in the midst of her darling children, and return home to find her a corpse, and my poor children motherless.' And he continued, 'Must I suffer this torture of mind for six weeks, and then, perhaps, lose her after all? I cannot endure it. I will submit to any plan you may suggest, but, for God's sake, ease my suspense and save my wife.' He was a solicitor, a man of great intelligence and good common sense, therefore I felt confident that any feasible suggestion I might make would be readily acceded to.

About six hours after this painful interview I decided to recommend the artificial induction of premature labor, stating, however, that I had no practical experience of such a plan in similar cases; still I urged in its favor the following advantages:

1st. That he and his wife would thereby be spared a six weeks' suspense.

2d. That all loss of blood would, I hope, be prevented by the introduction of the spongio-piline tampon.

3d. That he could be sure of my attendance at the time of accouchement, and that I should be well prepared with appropriate means to meet any and every emergency.

4th. I informed him that, whereas 1 out of every 4½ mothers, and more than half the children, were lost in cases of placenta prævia, certainly less than 1 mother died in every 53, and at least two-thirds of the children were saved, where labor was induced, although, in many cases, the operation had been undertaken where there existed great deformity of the pelvis.

He and his wife readily acceded to my proposal, and it was arranged that I should carry out my suggestions on the following day.

Early in the morning of the 25th of June, 1859, I repaired to the house, and was gladly welcomed. There had been but a very slight sanious discharge since my last visit, apparently due to coagula in the vagina, which I had left undisturbed. Having once more carefully examined the abdomen, and made out the position of the child and the attachment of the placenta to the cervix, I removed, by a syringe and ice-cold water, the contents of the vagina, into which I carefully introduced No. 2 plug, with little difficulty and only slight pain, which I inflated until it occasioned my patient some discomfort. I then adjusted a bandage round the abdomen, under which and over the uterus I placed a large and firm pad. I also attached a silk handkerchief to the bandage in front, which I passed between the legs and fastened behind, which served to fix another pad, which was placed over the perinæum and vulva, so as to prevent the escape of the tampon. Having made these preparations, I commenced giving two-scruple doses of infused ergot, with a scruple of borax, every hour. I administered a stimulating enema of eight ounces of compound decoction of aloes, an ounce of turpentine, and twenty minims of tincture of nux vomica. From time to time brisk frictions were made over the abdomen, and she was fully supplied with hot milk brandy and nutmeg, and beef tea. After the third dose of ergot pains came on, which, after the fourth dose, increased considerably in frequency and power. She now began to complain of an intolerable desire to pass water, with a feeling that the plug was about to be expelled, consequently I let a little air escape from the tampon, thereby enabling her to pass a small quantity of urine; but as a little blood began to ooze from the vagina, I again inflated it. In about an hour from this time, and between five and six hours after the adoption of these various means, there was so much pressure upon the plug that I ventured to loosen the handkerchief between the legs and remove the pad, when I found the tampon forced upon the perinæum by each succeeding pain.

Fearing that any further delay in letting out the air might impede the expulsion of the child, or possibly lead to rupture of the uterus, I withdrew the plug, and, to my delight, not a wineglassful of blood escaped; and I found the head occupying the upper part of the sacral cavity, the os uteri much dilated, and the membranes tense. Projecting from the posterior segments of the os, a large piece of very firm placenta could be detected. The pains were now frequent and severe, and, in little more than an hour, a living male child was expelled, which, although very pallid, screamed immediately. The placenta was soon extracted, and there was scarcely any blood lost, certainly not so much as after an ordinary labor at term.

On examining the placenta, about a sixth of its size looked somewhat smaller, and in a highly congested state; it had lost its spongy texture, and appeared torn here and there.

Unfortunately it was disposed of, or I intended to have made a careful examination of its condition. This lady made an excellent recovery, and was enabled to suckle her baby, which she had not been able to do on any previous occasion. The boy is still living, and is one of the finest fellows I have ever seen."

HEMORRHAGE AFTER EXPULSION OF THE FŒTUS.

Between the time of the expulsion of the fœtus and the delivery of the placenta, we may occasionally have fearful losses of blood. Two conditions are indispensable to such losses: the partial or complete separation of the placenta from its attachment to the uterus, and imperfect contraction of the uterus. If the placenta adheres throughout, there will be no bleeding, no matter what the condition of the uterus may be; and if the uterus contract energetically and uniformly, the placenta will be separated, but there will be no hemorrhage. Imperfect contraction of the uterus occurs under different circumstances and in different degrees; sometimes there is barely a feeble effort at contraction, the organ remaining large, and scarcely hard enough to be distinguished in the abdominal cavity by the sense of touch. If the uterus is contracted sufficiently to prevent hemorrhage, it ought to be firm in feel, round, and, with the placenta still in its cavity, not extend above the umbilicus. But instead of this slight contraction there may be strong pains, but the uterus contract only partially in extent. The fundus may be contracted around the placenta, while the lower part of the uterus is scarcely contracting at all. This is imperfect on account of its irregularity. Atony or complete want of contraction occurs after exhausting labors, condition of great general prostration, more frequently in multiparæ, and not unfrequently in very rapid labors; and the circumstances that cause it cannot always be appreciated. It is recognizable by the great size of the organ, lack of firmness, and the absence of pains and contraction. When the placenta is wholly or in part detached, hemorrhage is fearfully copious; but if this separation has not taken place there will be no hemorrhage. The treatment consists in the use of ergot in full doses, administered immediately upon the recognition of the condition; friction upon the abdomen; grasping with much strength, and even rudeness, the uterine globe. These means will be sufficient, and should not be exceeded if hemorrhage is not considerable; but if the bleeding is copious the hand may be introduced, with the expectation of stimulating the uterus to energetic action, and the expulsion of the placenta and hand both. The hand is introduced in cases of mere atony, not to remove the placenta so much as to cause the uterus to contract: external pressure may be combined with internal irritation. When the hand is introduced it may be carried to the fundus, the fingers spread out and brought in contact with the mucous lining of the organ, or the placenta may be grasped, and, included in the clenched hand, may be moved toward the cervix, and if contraction occur, withdrawn. It is better not to withdraw the placenta until contraction does take place. Irregular contraction, with retention of the placenta, is not unfrequently observed. The irregularity consists in the contraction of the portion of the uterus below the placenta, while the portion above is in an expanded condition. Even this kind of contraction is not always attended with hemorrhage, although sometimes the bleeding is fearfully copious. The shape of the uterus under these irregularities of muscular action is quite different in different instances. The organ is elongated so that the fundus reaches up to the ensiform cartilage. This part of the uterus, containing as it does the placenta, is also very much larger than below. At or near the umbilicus is a constricted place in the mass, while still lower down toward the vagina the organ is somewhat expanded. This is what is known as the hour-glass contraction. [Fig. 146.] The placenta is imprisoned above the central constriction, which is very firm. Instead of this kind of contraction the placenta is enveloped in a separate compartment, formed by the angle between the body and fundus, the constriction formed by fibres that extend from the centre of the fundus down the side of the uterus. Attendant upon the irregularities of shape is severe pain, called by the patient cramping pains. The pains give the idea to the patient that instead of being propulsive the force of them is exerted upward. They say the pains "work up." These pains, with the irregular shape of the uterine globe, are sufficient to diagnosticate this condition. This kind of irregular contraction may take place in labors where the liquor amnii has been long drawn off, and the uterus has begun to assume irregular shape before the fœtus is expelled; or by too rapid delivery, and, as believed by some, when the cervix uteri has been irritated by too much or injudicious manipulation. But I think by far the most frequent cause of it is adhesion of the placenta. The placenta being situated at or near the fundus, and adhering so as to prevent the fibres over which it is implanted from contracting with the contraction of the fibres in the body below, the arch-like rotundity is lost; and the farther the contraction goes the more the equilibrium in the shape of the organ is lost, until the irregularity is marked and troublesome. Whether the adhesion of the placenta is the cause or not, it often exists in connection with it, and the retention of this organ is one of the most important circumstances attending upon the condition. If the placenta is partly or wholly

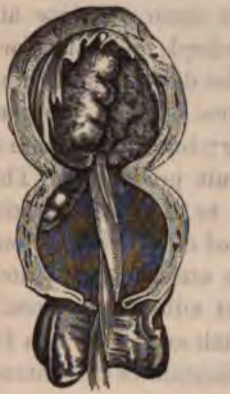


FIG. 146.—The so-called hour-glass contraction of the uterus and imprisonment of the placenta.

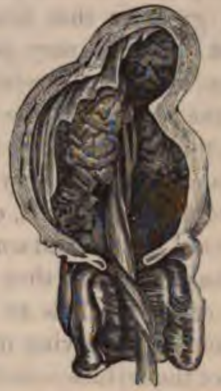


FIG. 147.—Irregular contraction of the uterus and retention of the placenta.

separated, there often is very dangerous hemorrhage, as the effect of the two conditions. The portion of the organ on which the placenta grew, and in which it is imprisoned, is prevented from contraction, consequently the mouths of the ruptured vessels are patent and permit the escape of blood. Although the hemorrhage is not so great as that attendant upon absolute atony of the uterus, yet it is often very great indeed, and calls for prompt action. The treatment consists in the dilatation of the constricted part and the removal of the placenta. When the placenta is not adherent, this is no difficult matter; but if adhesion is firm, it is sometimes a severe and very difficult procedure. The adhesions are of two different kinds, owing to the cause producing them. The one kind is firm, and consists of the agglutination of the surface of the placenta to that of the uterus, by the intervention of fibrinous effusion. It is an actual adhesion, generally small in extent—seldom occupying more than an eighth to a fourth of the diameter of the surface—and, as adhesions of this character usually, is the product of inflammation. As before remarked, it is firm, sufficiently so to resist the separating influence of uterine contractions. The other seems to be simple hypertrophy of the utero-placental tissues, the connective tissue, coats of vessels, etc.,—which, without deserving the term adhesion, more than ordinarily resists the force exerted by the uterus in the parts to which it is attached, prevents ready contraction there, and thus breaks up the uniformity with which the whole organ is diminishing in volume.

Treatment.—A patient the subject of this irregular contraction should not be left; but if there is no hemorrhage there is not any need of immediate operative procedure. We sometimes can succeed in overcoming the forcible contraction at the point of constriction by one or more full doses of opium, and when this is the case, by grasping the upper or non-contracting portion, induce sufficient action to cause separation and extrusion of the placenta. Failing in this, or if there is considerable hemorrhage, we must proceed at once to the delivery of the placenta. Holding the cord in the left hand in such a way as to tighten it, we use it as a guide to conduct the right hand to the placenta. We fold the right hand in the same way as directed to do in the operation of turning, and carry it up through the vagina into the uterus, along the cord, to the constricted portion, into which we introduce first the index finger, then the middle, to be followed by the other two, separately, until all four have been admitted. The whole hand is then gently urged forward until it has passed the narrow place, into the chamber occupied by the placenta. An examination of the edges of the organ will enable us to determine whether the placenta is already detached or not. If it is adherent throughout we may conclude, with a good deal of certainty, that the adhesion is of the second, or less firm variety. But if a large part is separated, and the adhesion is confined to a small portion, we will have to deal with the more difficult form. If of the second form, we can usually cause a separation by placing the tips of the four fingers—spread out—at the edge of the placenta on one side, and the thumb on the opposite edge, and grasping the whole placental mass, at the same time pressing them against the inside of the uterus. This manœuvre stimulates the uterus to contraction, and, in much the same manner that the uterus does, condenses the dimensions of the placenta, and slides it upon the place of attachment. When detached, the doubled hand, with the placenta included in it, may be withdrawn, when contraction will be perfect. If, however, after the hand has been introduced in contact with the placenta, we find the adhesion to be fibrinous in character, the fingers are to be brought up between the separated portions of the placenta and uterus to the point of adhesion, and by forcibly inserting them between the two, peel off the placenta. This may, and I think generally does, involve the necessity of great disruption of the placental tissue, and we should be careful to separate it as completely as possible. Another form of irregular, or rather feeble contraction of the uterus with retained placenta is sometimes observed, and generally with very great hemorrhage. I mean when there are apparently strong pains, the uterus contracts, feels very hard for a moment, but soon after expands and feels very soft, after a while contracting again. At the times of the pains fluid blood and clots are thrown out of the uterus in copious quantity, the pain subsides and the uterus relaxes, blood is extravasated into the cavity of the uterus, and thrown out again with each recurring pain. This is continued until grave symptoms, indicating great loss of blood, manifest themselves. In this form of hemorrhage the uterus must be stimulated to efficient contraction by ergot, grasping of the uterus, and cold if necessary. It is not generally difficult to manage these cases if properly watched;

but the pains are apt, for a time at least, to deceive the practitioner into the idea that all is going on well and the placenta will soon be expelled. In rare instances, it may be necessary to introduce the hand to stimulate the uterus to sufficient action, to suppress the hemorrhage, and remove the placenta. After the placenta has been removed by introduction of the hand, it ought to be thoroughly and carefully examined, to assure ourselves that it is wholly extracted. We will hardly fail to completely remove it if we are careful in our manipulation for the purpose, but should half, or even one-third, be left behind, it would be better to again introduce the hand, search for and remove it. If but a small piece is left behind, we will not be justified in risking the great irritation of a blind search for it. The first effects of leaving a portion of the placenta in the uterus are harassing and painful efforts at expulsion, and hemorrhage; the secondary are such as arise from animal decomposition, fetid and acrid discharges, sometimes excoriating and inflaming the parts, at others causing toxæmia and speedy fatal results, or protracted suffering from fever, and the colliquative discharges associated with it.

In case of retention of a part of the placenta, and we find it impracticable or impolitic to remove it, we may do much to prevent its bad general effects by injections of tepid water into the uterine cavity, with some carbolic acid dissolved in it, three or four times a day; giving the patient internally the sulphate of lime or soda, with nourishment, and, if need be, stimulants.

Hemorrhage after the delivery of the placenta is sometimes one of the most fearful and appalling accidents that can befall a woman. It comes often unexpectedly and with overwhelming effects, eventuating in death in a few minutes. The practitioner should not forget that no case is absolutely free from this terrible complication to labor. Atony, or want of contraction, is the condition of the uterus in which it occurs. It is less common in primiparæ than in women who have had children, and it seems to be more likely to occur in patients who have suffered in previous labors. Exhausting, tedious, or difficult labors are more frequently followed by this uterine atony than quite natural cases. Anything that renders the fibrous tissues weak, and reduces the nervous susceptibility of the organ, predisposes to this sort of derangement. Some families would seem to be more liable to post-partum hemorrhage than others. The source of the bleeding, as in all other forms of uterine hemorrhage during pregnancy and labor, is the ruptured utero-placental vessels, which remain open for want of contraction of the uterus. Uterine atony, at this period, is sometimes absolute in such cases: there seems to be no tendency to contraction, the uterus remains large, the walls soft and flabby, so much so, in fact, that it is difficult to discover the outline of the uterine tumor in the abdomen, and there is no pain or effort at contraction. In other cases, less profound, there are alternate efforts at contraction and relaxation; the uterus contracts, and it may be felt to harden, but relaxation takes place again, and when contractions occur blood is expelled in considerable quantities; so there are pains and intervals, but the uterine globe does not decrease in size, it remains large, and the patient complains, when the pains do occur, that she is flowing badly. Some very fearful hemorrhages occur in connection with very painful contraction. The patient complains that the pains are more excruciating than in labor; they occur frequently, and are very severe. As observed by Dr. Meigs, in such cases the blood is apt to be imprisoned in the uterus under such circumstances, the mouth of the organ having been plugged by a clot or piece of membrane. The uterus expands in such cases, increasing in size between the pains, feeling quite soft, but at the time of pain hardening up very decidedly. This is concealed hemorrhage, and we should not be deceived, by the great complaints the patient makes of pain, into the idea that contraction is good. The symptoms of uterine atony after delivery are generally sufficiently obvious to be recognized at once. There are some things about the general condition of the patient immediately after delivery that lead us to suspect a strong tendency to hemorrhage. The pulse is almost always quick. As a rule in natural labor, the pulse, immediately after the placenta has passed off, falls rather below its ordinary frequency: it is slow, soft, and compressible; but the pulse that indicates approaching hemorrhage is quick, sharp, and hard, and generally full. The patient is ordinarily quiet, happy, and disposed to sleep; but if disposed to hemorrhage, restless, or very much prostrated. The pulse is a valuable index to the hemorrhagic condition, and I am loath to leave a patient with a quick pulse immediately after delivery, until all the time for danger from this source has certainly passed.

Discharges of blood, the flaccid condition of the uterus, and an absence from pain, are the first evidences usually observed to indicate hemorrhage; but the patient generally soon begins to complain of want of air, blindness, or deafness, or sense of faintness and nausea. These symptoms increase, but as I have given the general symptoms of hemorrhage elsewhere, it is not necessary to rewrite them. The prognosis in these cases is very grave, more so in complete atony and less so where there are efforts at contraction. But all forms of it occurring must be met with promptness and energy, not because nature never is sufficient to save the life of the patient,—for we are often called on to see patients that flowed fearfully before the contractions of the uterus returned and checked the bleeding,—but the loss of much blood at confinement is a serious damage to the strength and vitality of a patient who has to do the duties of a mother for so many months subsequently.

The object of treatment is to cause permanent and complete contraction of the uterus; but before this can be accomplished, and as means to that end, compression can be resorted to. The first thing the experienced practitioner does when he finds evidence of hemorrhage is to grasp the uterus between the two hands, or by clenching one on it, to stimulate it to contraction, and continue to knead and press it with the hands in this way until he is satisfied with the condition of it.

If the uterus is insensible to this kind of treatment we may be assured of the necessity of continued energy of action and great watchfulness. If possible to procure it, a full dose of ergot should be immediately given, and repeated in ten or fifteen minutes. My usual plan of treatment, when I find that grasping and kneading will not do, is to place a solid compress over the hypogastric region, large enough to fill up the space between the two iliac bones, from the pubis to the umbilicus, and press it back toward the spine with sufficient firmness to close the uterine cavity, and press the anterior and posterior walls of the uterus firmly together. A book two inches thick and large enough will be easily obtained, and makes an excellent compress. It should be kept in position and managed by the practitioner until there is decided evidence of contraction, and then confined there by the binder for some hours. If the relaxation is less considerable, cold water poured on the abdomen, in a full stream, from a height of four or five feet, ice bags applied to the abdominal surface, pieces of ice introduced into the uterus, or ice water injected into the uterus, has been recommended by some. Even the tincture of iron has been used for this purpose. When the atony is very profound, many authors recommend the introduction of the hand, and Dr. Gooch recommends us to search for the place whence the placenta was detached, and make pressure upon it with the clenched fist, and if it is on the anterior wall to press that part between the hand within and the one over the abdominal surface. The main thing is to stimulate the uterus to contractions. All these things are doubtless efficacious, but I think, to some extent, injurious, and I now content myself with grasping the uterus vigorously, and pressing it against the back, first with my hands, or, if this seems not to be sufficient, to use the hard compress made with a book, and administer ergot freely. As the effects of the hemorrhage begin to show themselves, we can avail ourselves of the treatment for the consequences of hemorrhage, as position, tourniquets, stimulants, etc. Another temporary expedient against uterine hemorrhage is compression of the aorta, to prevent the blood from being thrown into the uterus. This may be done by feeling for it below the diaphragm, and with the fingers pressing it strongly against the vertebral column. For the atony with hemorrhage in which the blood is retained by some obstruction, the only different kind of treatment from that described is to remove the obstruction, by introducing the fingers and hooking away the clot or membrane covering the mouth and occluding it.

Atony of the uterus, as here described, with hemorrhage, immediately succeeds delivery of the placenta. Within an hour, generally, it is quite manifest. But sometimes several hours afterwards the uterus seems to relax, become soft and flabby, and hemorrhage of a very serious, and sometimes even fatal character supervenes. This is relaxation from primary contraction. But we may quite unfrequently have sudden large and even disastrous losses of blood for the first fourteen days after delivery; I have not known them to occur very profusely after this period. These hemorrhages show that the involution which is usually going on during that time has been delayed, that the circulation of the uterus is still large, and the mouths of the utero-placental vessels are still patent. Upon examining the uterus we shall find that it is yet to be felt considerably above the pubis, and that the mouth is open enough to admit two fingers, and the cervix large and puffy to the touch. The discharge comes on suddenly, and generally results from some kind of vascular excitement. The treatment consists in quietude of body, and ergot administered once or twice in twenty-four hours, so as to induce ergotism, or aromatic sulphuric acid, cold application, friction and pressure over the uterus, etc. (See "post-partum hemorrhage" in my work on Medicine and Surgery of Women.)

As has been stated, some patients are predisposed to post-partum hemorrhage, and have severe loss at each confinement. When this is the case, measures should be used to avoid it. We ought also to expect, and be governed in our actions by the suspicion, that after tedious labor, labors in which the liquor amnii has been evacuated early, and, in fact, any of the conditions that usually precede it, the occurrence of atony of the uterus. When we have good reasons for suspecting this kind of hemorrhage, we should administer ergot at the right juncture to induce its influence in time to expel the placenta, and continue its influence on the uterus for some time afterwards. The best time is either immediately before or after the expulsion of the head. As in many cases of labor we cannot calculate the exact time when the head will pass the external parts, and there is generally an interval of several minutes between the time of the expulsion of this part and the shoulders and body, it is quite well to give the ergot immediately after the delivery of the head, and then again before the placenta is delivered. In all such cases the whole delivery should be left to nature, and the uterus should be emptied slowly.

INVERSION OF THE UTERUS COMPLICATING LABOR.

I take the liberty of copying a part of the article on this subject from my work on Medicine and Surgery of Women. "Inversion is the turning of the uterus inside out, with the fundus downward and the cervix upward,—a reversal of its surfaces and ends. It is partial or complete. When partial, the fundus is depressed in all degrees, from a mere indentation to a considerable protrusion through the cervix and os uteri. The depression of the fundus, or partial inversion, passes into the complete form when the whole organ, fundus, body, and neck, have passed through the mouth, and hang down below it. The vagina sometimes is inverted with the uterus more or less completely, adding very materially to the length of the protruding tumor. Inversion complicating labor almost invariably occurs either anterior to, or at the time of the removal of the placenta, but several hours, and, in very rare cases, several days may elapse before it is complete and discovered; for it is quite probable that in these instances partial inversion, or greater or less depression, had existed from the time of the delivery. It is believed that there are two modes observed in the process of inversion. Sometimes the fundus is indented and depressed in the cavity of the body, like the bottom of a 'junk bottle,' the depression rapidly or slowly increasing until the fundus has passed completely down, and the inversion is complete. At other times the whole of the fundus and more or less the whole of the body of the uterus is firmly contracted, while the cervix is flabby and relaxed. In this condition a slight amount of abdominal tenesmus will drive the contracted portion of the organ down through the relaxed cervix; and thus initiated it requires but a continued action of the fibres and the abdominal muscles to finish the process.

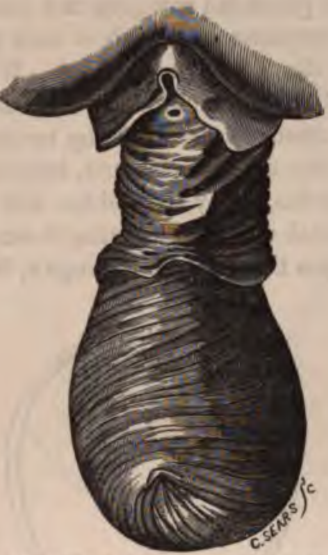


FIG. 148.—Complete inversion of the uterus and vagina.

The causes of inversion are not always obvious, as cases have occurred under circumstances when least expected from any discoverable reasons, and at other times inversion fails to be brought about by conditions that are usually enumerated as sufficient. We occasionally meet with instances that have no history, and neither patient nor physician can give us a clear idea of the time or manner of the occurrence. Such a case was the subject of litigation in this city a few years since. We have one of the same kind in the Jewish Hospital now, and other cases are on record. When the uterus is enlarged by recent expulsion of the fœtus, traction on the funis or placenta, injudicious or accidental pressure on the fundus, or by the sudden and powerful contraction of the abdominal muscles, thrusting the contents of the abdomen downward upon that part of the organ, it may be inverted.

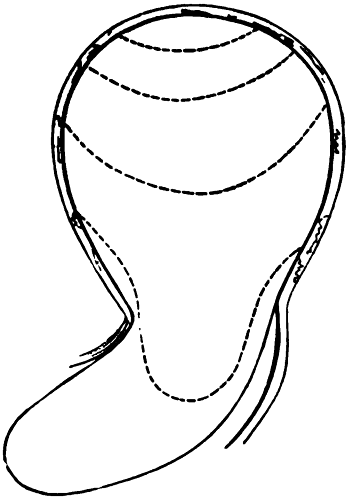


Fig. 149.—Inversion by depression of the fundus, the faint lines showing the different degrees.

It is possible also, doubtless, that the irregular action of the fibres of the uterus may cause the initiation and completion of the process of inversion. [Fig. 150.]

It is then said to be spontaneous. The irregular contraction that results in inversion may commence before the expulsion of the child. It would seem, however, from the statistics of Drs.

West and McClintock, that this accident is exceedingly rare under good management in labor. It has not been encountered in patients confined in the London Maternity Charity nor the Lying-in Hospital of Dublin in 140,000 cases.

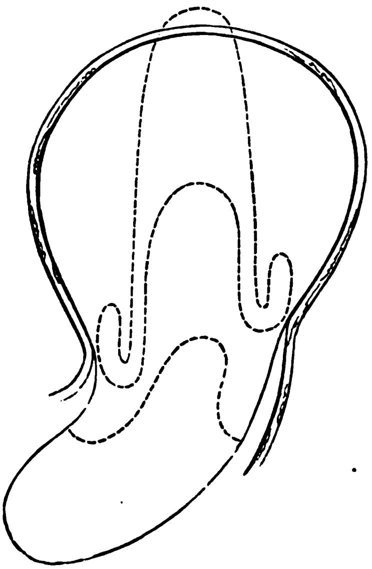


FIG. 150.—Inversion by irregular contraction, the faint lines showing the different degrees.

Symptoms.—Usually these are appalling in the extreme. Without warning, the patient is seized with great pain and symptoms of prostration, profound faintness, coldness of the extremities, rapid and very feeble pulse, oppression about the heart, copious perspiration, hurried breathing, often vomiting, ringing in the ears, and blindness. Soon these symptoms increase until the patient lies in a state of collapse, indifferent to everything transpiring around her, or throwing herself in every direction in paroxysms of inexpressible agony. This state of collapse is not always the result of copious hemorrhage, but seems to be partly of nervous origin. It is a shock not unlike that caused by severe accidents, as falls, strokes, etc. But generally mingled with this sort of impression, there is profound exhaustion from loss of blood. From this state of collapse the patient may very slowly rally until she enters a tedious and imperfect convalescence. Or in others, where the exhaustion from loss of blood is added to the great depression of shock, the patient may be overwhelmed, and in an hour, or a few hours, her sufferings end in death. Imperfect recovery from the grave effects of the first shock may enable the patient to live for several days, and at last, in five, ten, or more days, die. In case the patient recovers from the first symptoms, after some weeks she may regain a fair state of health and retain it, or even improve, until lactation gives place to ovulation, or until this last function supervenes upon the first.

When the symptoms present themselves so as to awaken suspicion, the *diagnosis* of recent cases may be made clear by the descent of a tumor into or nearly through the vagina, and the absence of the uterine globe above the pelvis. The uterus is sensitive, contracts and expands upon handling, and if the placenta is not expelled it may be felt or seen, with the cord implanted upon it.

Prognosis.—Scarcely a more grave circumstance can complicate labor than inversion of the uterus. The danger is great and imminent. In a considerable majority of cases proving fatal, the patient dies within a few hours. Mr. Crosse says, "In seventy-two out of one hundred and nine fatal cases, the patient died in a few hours, eight of the remainder within a week, and six more within four weeks. Death soon after delivery seems to be the result of rapid exhaustion of the vital powers, by the terrible shock to the nervous system, and the profuse hemorrhage that often complicates it."

Treatment.—The management of recent cases will be the easier the sooner it is commenced. The reduction of the uterus is generally successfully accomplished within the first hour or two if intelligently attempted. The first item for consideration is to determine what shall be done with the placenta, when the uterus has not detached it before, during, or after the descent. If the placenta is wholly adherent, its attachments should in no wise be disturbed until the uterus is returned to its natural position; but if it is partially detached, it should be immediately separated by gently peeling it off with the fingers. This instruction has reference solely to the prevention or lessening the hemorrhage. If the placenta is attached throughout, the hemorrhage will be trifling; if partially detached it may be removed, to allow contraction to take place with more certainty. It is well known that sufficient contraction of the uterus will separate the placenta, and when not contracted enough to do so it is in too lax a state to require its detachment. If the placenta is partially separated, the completion of it by the fingers, as in the case when included in the uterus, will enable and stimulate this organ to contraction and thus suppress the hemorrhage. I do not think the question of convenience of returning it, or the possibility of being foiled in the reduction by the continuance of attachment, should be entertained. The want of contraction enough to throw off the placenta is an evidence of such profound inertia as to insure easy reduction of the uterus. Having decided upon what course to pursue with the placenta, immediate efforts should be made to revert the uterus; and, before beginning these efforts, we should remind ourselves of some facts in the case that are apt to be lost sight of in the hurry and confusion of such an appalling occasion. One fact is, that immediately after the occurrence of the accident, the uterus is in the same flaccid condition in which it was incapable of resisting the cause; another is, that it soon begins to contract, becomes firm, and, consequently, more to effect by counter-influences; and a third, that the more the uterus is stimulated by handling or otherwise, the sooner and more firm the contraction becomes, and, consequently, the greater difficulty in reduction. No operator has complained of the bulk being too great to return, but all of the resistance caused by contraction. The experience of Dr. Meigs is conclusive on this point. He found that, upon attempting to reduce the size of the uterus by squeezing it to expel the blood, he caused it to contract, and it became so hard as to resist his efforts to push it up within the os, but as soon as he pressed upon the fundus he could dimple it, and by continuing the pressure he made the fundus ascend into the body, through it to the cervix, and finally up to its proper place. The reversion was commenced at the fundus by a dimple, and was completed by the portion of the fundus thus first impressed being kept in advance. I am quite decidedly of the opinion that it increases the difficulty to try to lessen the bulk of the uterus by squeezing. The best plan, therefore, is to introduce the left hand into the vagina, carry it up to the point of flexure or commencement of the inversion, and steady and guide with it the direction and effects of the fingers from below, while, with the knuckles or ends of the fingers of the right hand applied to the most depending part of the fundus, steady and continuous pressure is kept up in the direction of the axis of the uterus until the fundus is pressed up, and, passing through all the other portions, finds its way above the pelvic brim. The placenta, if still attached, should be managed as though the inversion had not taken place. The binder is applied, and other attentions as usual. The after treatment will consist in cordials, stimulants, and nutritious measures, administered according to the exigencies of the exhaustion or nervous depression.

For a more complete and detailed account, especially of chronic inversion, see Med. and Surgery of Woman.

RUPTURE OF THE UTERUS.

The uterus sometimes is torn, so that its contents escape more or less completely into the peritoneal cavity, and the intestines and other of the abdominal viscera are permitted to enter the organ, and even to pass through it into the vagina, and finally appear externally. This accident occurs at any time during pregnancy or at the time of labor. Any kind of patient, primipara or multipara, may be the subject of rupture of the uterus during pregnancy; but it is observed much more frequently during labors in primiparæ. During pregnancy it seems to result from former disease of the uterus, or disease or other abnormal condition of the ovum. The uterine fibres degenerate, becoming transformed into a more frail tissue, as adipose, from insufficient vascular supply, or they are not developed, and at the part the tissue is more cellular, and the parts are stretched instead of hypertrophied, until it becomes so thin by distention as to finally give way, or from inflammatory action the muscular tissue is infiltrated by fibrin, and is now easily torn by distention. In connection with one or more of these forms of degeneration there is sometimes a dropsical state of the ovum, necessitating a more speedy development than can be accomplished, or there are twins in the uterus. The occasioning causes of rupture during pregnancy are sometimes external, as falls, strokes, etc. Rupture during pregnancy is much less frequent than at the time of labor, and the accident takes place almost invariably during the second or expulsive stage. It is computed to occur once in thirteen hundred and thirty-one cases of labor. This is fearfully frequent for such a terrible accident. The causes of rupture during labor are such as resist the expulsive efforts of the uterus, as contracted pelvis, osseous tumor, or exostosis, obliquity of the uterus, causing the head of the fœtus to be pressed against the sacrum or sides of the pelvis, malposition of the fœtus, as in shoulder presentation, etc., or when the fœtus is badly formed or monstrous in shape, making its passage through the pelvis impracticable. It is sometimes caused by the impetuous action of the uterus itself when under the influence of ergot, in cases of moderate obstruction, or occasionally the spontaneous action of the organ is sufficient. Rupture is more likely to occur in cases where the liquor amnii is evacuated, and the uterus is contracted around the irregularities of the fœtus, causing it by the projections of the shoulders and other prominent points over which the uterine fibres are stretched out thinly and stimulated into more vigorous contraction. The rupture may involve all the divisions of the uterus—the fundus, body, and cervix. We have a specimen in the museum of the Chicago Medical College that presents an example of this extensive laceration. The rent commences in the fundus, on the right side of the uterus, about midway between the middle of the fundus and insertion of the Fallopian tube, extending down, without involving the Fallopian tube, through the body to the junction of the vagina. This specimen was taken from the body of a woman just about the end of the eighth month of pregnancy. It ruptured while she was engaged in her ordinary household duties, and she was unconscious of violence of any kind having been applied. Sometimes the rupture is in the cervix alone, or in this part extending into the body. In the cervix it is often transverse in direction. The longitudinal rupture is the kind always found during pregnancy; both the longitudinal and transverse may take place during labor. The rupture of the cervix transversely is more apt to be the result of labor in contraction of the pelvis and obliquities. There is great variety in the extent of laceration. Sometimes, upon examining a cadaver, the fibrous structure is found to be torn through, while the peritoneal covering has resisted the influences and kept the parts well together. No symptoms indicate this state of things, and the patient may recover without any bad effects; or it may be extensive and immediately arrest labor. If the rupture is small, the liquor amnii alone may escape; but if it is extensive, the limbs, hips, body, and even head of the fœtus may pass through into the abdominal cavity. The placenta may be retained in the uterus after the expulsion of a part or the whole of the fœtus, or this too may pass through the rent, and leave the uterus entirely empty. A small longitudinal laceration is not incompatible with efficient labor, but a transverse necessarily almost becomes extensive and disastrous.

Symptoms.—The premonitory symptoms of laceration during pregnancy are so uncertain that they cannot be relied upon. They are such as indicate disease of the uterine tissue, as tenderness of the uterus in one particular part, pain, feeble contractions, etc. When the disaster is upon the patient she is suddenly seized with a feeling of some terrible accident in the abdomen. Some of the patients speak of it as a sense of "tearing," "giving way," while others are conscious only of a severe pain in the part. Succeeding these local symptoms are general phenomena of very significant character, such as coldness, faintness, excited pulse, rapid respiration, and in fact all the symptoms of collapse to a greater or less degree. The pain continues to a very distressing extent. Generally the cold symptoms and pain are succeeded by delirium, feeble pulse, hurried respiration, great restlessness, vomiting, and in the course of ten to twenty-four hours death from deep collapse. Such cases are found to prove fatal as a consequence of the loss of blood, which is extravasated from the torn uterine arteries and veins, contained in and distending the abdominal cavity. In other cases the symptoms of collapse are followed by more or less febrile reaction; violent peritonitis is awakened, and the patient perishes from this cause in a few days. Or the inflammation subsides slowly, and after a tedious and devious convalescence the patient regains her health more or less completely. The fœtus has become encysted in these last cases by the fibrine effused during the inflammation, and may always remain so, without proving injurious or even inconvenient, except by its bulk; or, after a time, suppuration, exulceration, and discharge may rid the patient entirely of her difficulty. The exhausting processes attendant upon this suppuration and discharge not unfrequently wear the patient out and prove fatal. The symptoms during labor are somewhat different. There are premonitory and threatening symptoms almost always. The pains are stronger and of more protracted duration, and occur more frequently than usual, while the presenting part is not adequately effected by them. The known existence of any of the obstructing causes would be the cause of great alarm with these symptoms. If the rupture takes place an immediate and very marked change takes place. The labor pains cease, no more heaving down or expulsive efforts are made by the uterus, but a constant and fixed pain is experienced in some particular part of the abdomen. In some instances the patient is sensible of some "giving way or tearing" having occurred during a long and severe labor-pain. The tumult of a hard and urgent labor is quieted in alarm and apprehension. The pain continues, and becomes more severe. The patient goes into a state of collapse, and dies in a few hours from loss of blood, or the accident is followed by fatal peritonitis. And in very rare instances the fœtus is encysted and remains in the abdomen for years. The *diagnosis* is not usually very difficult; the presenting part no longer advances, and sometimes recedes beyond the reach of the fingers entirely. By examining the abdomen externally the parts of the fœtus that have escaped from the uterus into the peritoneal cavity may be felt with unusual distinctness. And by introducing the hand we may discover the rent, and perhaps the vagina filled more or less completely with the intestines. When the uterus has more or less completely discharged its contents into the peritonæum, it contracts down as far as it is permitted by the portion still remaining in it. If the whole ovum is thus passed through the rent, the organ will assume its usual post-partum dimensions. A careful examination will enable us to feel the outline of the contracted viscus. We may discover this contraction also by internal examination. The prognosis is very grave, but not absolutely desperate, as some cases do get well without artificial assistance, and still more by skilful management. The dangers are hemorrhage and inflammation. Some patients undoubtedly die of the shock, but more of interperitoneal hemorrhage, and perhaps the greater number perish from the general pelvic and abdominal inflammation that ensues. When the hemorrhage is not fatal, it is because the torn vessels are closed by uterine contraction, as in all other instances of uterine hemorrhage;

art does very little, if anything, toward checking the bleeding more than to promote contraction. As before intimated, nature sometimes turns the inflammation to account by forming a fibrinous cyst about the fœtus, and thus encasing it in an innocuous covering which is tolerated without inconvenience; or by one great abscess the whole is discharged in a flood of pus; or piecemeal through an artificial opening. The objects of the *treatment* are, first, to prevent the accident by removing the obstacle when this is practicable, by delivering the fœtus with the forceps, crotchet, or other means indicated by the circumstances attendant upon the case; and, second, to prevent and repair the damage that results after the accident has taken place. And the first thing to be thought of is delivery of the fœtus and secundines, as the best means of permitting the uterus to contract and check the hemorrhage, and remove the cause of inflammation of the peritonæum. The method of delivery will depend upon the situation of the fœtus and placenta with reference to the uterus. If the head is in the pelvis, or at the superior strait, we may almost always apply the forceps and deliver with them, which is much the best way, when practicable. The operation under such circumstances is performed as directed when speaking of the use of the forceps, except that as there is danger of the head slipping through the rent and being lost in the peritoneal cavity, much more care is necessary in their application. The head should be held firmly in position by an assistant. The assistant may lay hold of the parts that have escaped, by including in his grasp the abdominal walls, and pressing the presenting part downward while the forceps is being applied. The operator should be very careful not to press the head upward by the forceps blades. When the forceps are applied, intermittent traction will soon enable us to deliver the fœtus. If we cannot draw the child through the pelvis in this way, the head may be held in the forceps until perforated and lessened, and thus put in a condition to pass through. If the head is too high to be thus apprehended by the forceps, and the child has not wholly escaped, and the rent large enough to permit the hand to pass through and seize the feet in the peritoneal cavity and deliver, that is the practice usually followed. This kind of delivery is practicable in most cases of transverse laceration of the cervix, as this part does not contract so readily nor so firmly as the longitudinal ruptures of the body and cervix do. Indeed, I think it would be very difficult, if not impossible, to take the feet from the peritoneal cavity through a longitudinal laceration of the body, on account of the contractions that would be excited by the attempt. If there is great difficulty in passing the hand through the rupture, it has been recommended to enlarge the opening in the uterus to permit the accomplishment of turning in this way. I would much prefer gastrotomy in this class of cases, than enlargement of the rent in the uterus; and I do not think any other operation than gastrotomy advisable where the whole body and head of the fœtus, and the placenta, have passed through the wound in the organ. In pregnancy, before labor has begun, there are two methods of delivery: one is to dilate the os by Barnes' elastic dilators, and deliver by turning or forceps; and the other, by gastrotomy. I think there is no doubt about the latter being the preferable operation, as it is more quickly done, can be always sure of success, and generally the whole fœtus has been expelled from the uterus. In gastrotomy it will be necessary to be very careful about cleansing the peritoneal cavity, as blood and fœtal fæces are apt to be there. The subsequent treatment is similar to that which is applicable to all great peritoneal accidents or operations, and need not be dwelt upon here.

RUPTURE OF THE BLADDER.

This is an exceedingly rare accident in connection with labor. In tedious labors, where the condition of the bladder is not attended to, it may become very much distended, and finally, if not relieved, burst and discharge its contents into the peritoneal cavity. When this is the case, the patient experiences a sharp pain, the result of the evacuation of the urine on the peritoneal surface; profound inflammation is the consequence, which speedily proves fatal. The symptoms which precede this accident are frequent efforts at urination, pain in the region of the bladder, inefficient uterine pains, and tumefaction of the hypogastric region. The bladder may be easily felt above the pubis as a soft fluctuating tumor, that extends sometimes as high as the umbilicus. The result of rupture of the bladder is always fatal.

Treatment.—As the rupture of the bladder does not affect the life of the child, it may almost always be saved, and the treatment should be shaped for this purpose alone. Hence, speedy delivery is necessary and proper, and the *method* of delivery should be such as will be more likely to save the child. If the head is well down in the pelvis, so that the forceps can be applied to it, this should be done as speedily as is compatible with its safety. But if the head is not thus situated, or if there is obstruction or difficulty of any kind that is likely to cause delay or require much force, or if the head is still high and within the uterus, the Cæsarean section should be performed at once. The only treatment that can benefit the woman is such as will add to her comfort while living. Chloroform and opium afford us ample means for this purpose and should be liberally used.

PROLAPSE OF THE CORD.

The funis may descend by the side of any presenting part,—the head, breech, feet, shoulder, or arm,—and appear external to the organs of generation before any portion of the fœtus. It prolapses with the head once in two hundred and eighty-two cases of vertex presentations (Churchill). When the cord is in advance of the presenting part, the amount of protrusion varies. Sometimes it merely comes to the brim of the pelvis, not entering this cavity below the head or other part, or a knuckle of it may extend into the pelvis; or, again, a considerable portion may prolapse into the vagina, and through it appear externally. It is quite certain, too, that a prolapse may not take place until the membranes are ruptured; but it is also true that the cord may lie in the membranous bag formed by the liquor amnii long before the head has engaged in the os uteri, and indeed before this last is at all open.

Causes.—Great length of cord and proximity of placental attachment to os uteri may be considered common conditions attendant upon prolapse of the cord. It is more likely to occur when the os uteri is not filled by the presentation, so that there is open space at some part of its circle, and a large quantity of liquor amnii is suddenly evacuated, floating it out. It occurs sometimes in twin cases, during the birth of the second child, probably because of the laxity of the soft parts permitting its easy passage by the side of the presenting part. When the pelvis is contracted, the promontory of the sacrum greatly projecting, or obliquities arrest the head at the pelvic brim, at the same time that the head does not fill the superior strait, the cord may pass the presenting part and prolapse. The *consequences* to the child are very serious, and often fatal. The pressure on the cord during the transit of the fœtus through the pelvis obstructs and sometimes completely arrests the circulation between the fœtal heart and the placenta, and thus prevents the oxygenated blood from entering the fœtal vessels, and also preventing the blood containing the effete materials in the fœtal system from passing out. This may take place before the head has entered the pelvis, when the cord is below the head and lying on the pelvic bones, and possibly even before the membranes are ruptured. From an opportunity I have had in two cases of computing the time a fœtus may survive complete

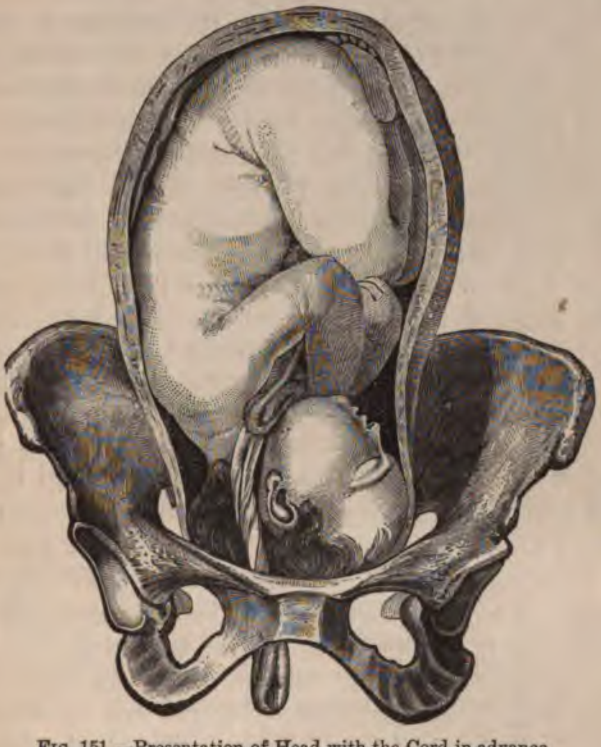


FIG. 151.—Presentation of Head with the Cord in advance.

arrest of circulation in the cord, I judge it to be about forty minutes, plenty of time in most cases to bring the head through the pelvis, either by means of the forceps, or in delivery by the feet or breech. The injurious pressure is almost always caused by the head, but in rare instances the breech, and even other parts, may do the mischief. While the pressure is generally sufficient in unaided cases of labor to cause fatal effects, it is not always so, and there are instances of spontaneous delivery being attended with complete safety, for the cord may lie in an angle of the pelvis at the sacro-iliac synchondrosis, by the side of the head, and escape deleterious pressure, or the head may pass through the whole pelvic cavity in less than forty minutes, and the child be born alive; or the head may be so small as not to exert sufficient force upon the cord to stop the flow of blood through it. The *diagnosis* should, if possible, be made before the membranes are ruptured. The cord contained in the bag of membranes below the head imparts a peculiar sensation to the touch, not unlike the feel of intestines, soft and mobile. The cord, in this situation, may be easily recognized by pressing it between the finger and presenting part, when pulsation will be distinguished without any difficulty or doubt. When the cord is thus discovered we should be careful to determine the part of the fœtus presenting, as upon this will, to some extent, depend the treatment. After the membranes are ruptured there will be but little difficulty in the diagnosis, as there is nothing with which it can be confounded that will come down into the vagina, and its pulsation is of course distinctive. Another item of diagnosis is to ascertain if the child is still living;—the pulsation may be so slight as to make it doubtful, or the cord may not pulsate and yet the fœtus live; yet the pulsation is the only evidence of the life of the child unless we auscultate. As the cord may be prevented from pulsating for forty minutes before the child dies, we must not be too ready to abandon the fœtus to its fate. The *prognosis* is grave. If left to nature the mortality is fearfully large—the largest in head presentation of all practicable natural labors. When judiciously assisted the prognosis is much more favorable, but still grave. I had a case of prolapse of the cord with shoulder presentation a few weeks since, and was fortunate enough to convert it into head presentation by external manipulation, and thus reduce the cord by Thomas' method. The child was expelled by the efforts of the uterus alone, and born alive. The patient was a primipara, and at first in the hands of a midwife, who had discovered all the difficult items of the case before she sent for me, and I arrived before the membranes were ruptured. Before the liquor amnii has escaped we can afford efficient and generally effective assistance; but after the head has engaged in the pelvis the dangers are very much increased, as fatal delay in the transit of the head cannot always be avoided.

The treatment consists in preventing fatal pressure by returning the funis into the uterus, and retaining it there until the head has passed; or cause the head to pass so rapidly as to get through the pelvis in less than forty minutes. The pressure may sometimes be prevented to some extent, also, by placing the cord in the left sacro-iliac angle of the pelvis, and when we cannot possibly do better, this should be attempted. Before the head has engaged in the pelvis, and the membranes are ruptured, we can sometimes avoid the pressure and change the position of the cord by placing the patient on her knees and chest until the head has engaged. Although, according to the researches of Birnbaum, the plan of replacing the cord by the knee-elbow position was practised as early as 1701, and by different European practitioners up to 1848, the members of the profession in this country are very much indebted to Dr. T. G. Thomas, Professor of Obstetrics, etc., in the College of Physicians and Surgeons, New York, for calling their attention to it, and giving explicit and profitable directions as to the best method of doing it. Dr. Thomas directs us, if the membranes are not broken nor the head engaged in the pelvis, to place the woman on her knees and chest, and have her continue in that position until these two circumstances have transpired. The cord will generally slide down the inclined plane formed by the anterior wall of the uterus, in this position, toward the fundus, and after the os is plugged by the entrance of the head into it the patient may assume the position on her side or back. If the cord has escaped with the liquor amnii from the uterine cavity into the vagina, the same position should be assumed by the patient, and the operator introduce the whole hand into the vagina, press the head a little upward and pass the cord above it with his fingers, and keep his hand there until several pains have transpired and the cord disappeared from his reach. The hand may then be withdrawn, but the woman should continue in the position until the head is engaged. Many cases of success have been reported

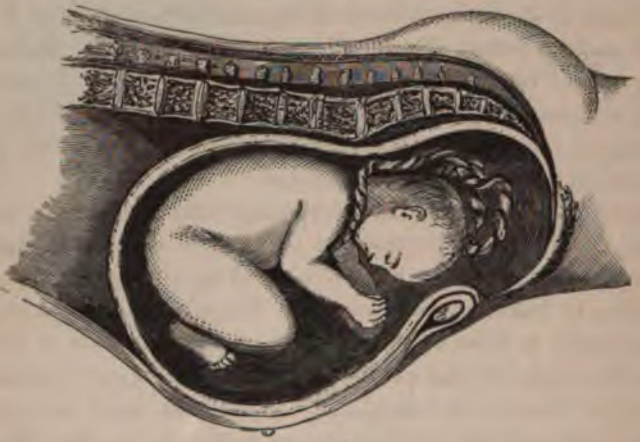


FIG. 152.

in this country by this ingenious method of treating prolapsed

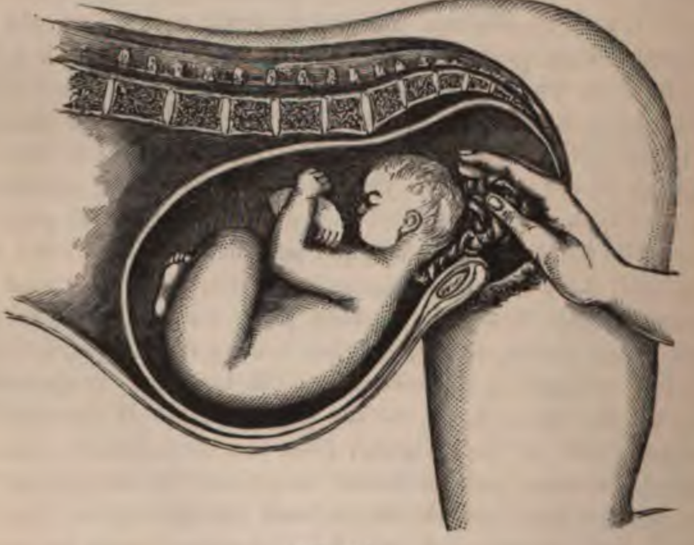


FIG. 153.

cord. Should it be found difficult or impossible to return the funis with the fingers thus, we may adopt Guillemot's plan of passing a tape or ribbon through the eyes of a flexible male catheter, with the stylet in the instrument, to keep it firm enough to be used well. The cord should be embraced by a loop in the ribbon attached to the catheter, and the whole introduced beyond the head. With the patient in the knee-elbow position, this plan ought to be easily executed. The catheter, after withdrawing the stylet, may be allowed to remain until the head is expelled, as it is not large or firm enough to impede the progress of the head or change its position. Some recommend carrying the whole hand into the uterus, and placing the funis high up toward the fundus. This course would be effective, if the patient was in the position to favor its retention. I think, however, that it can scarcely ever be necessary to resort to the introduction of the whole hand into the uterus for this purpose, and that we may succeed by one or the other of the methods mentioned before. If the head has engaged in the pelvis, the forceps should be applied in preference to any other means. The operator should be very careful not to pinch the cord between the forceps and the head, and this instrument should not be closed until the cord is tried, by pulling upon it, to see that it is not included in the grasp of the instrument with the head.

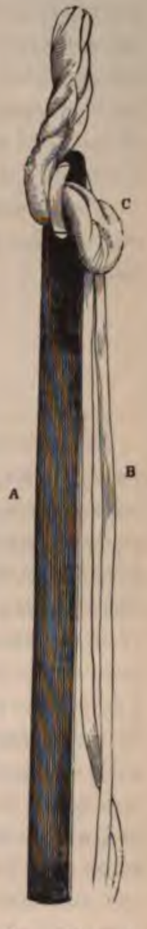


FIG. 154. — A. Catheter with the Cord, C., included in the Tape, B., held by the catheter ready to be returned into the uterus.

If the hand of the child is applied to the side of the head, and expelled with it, the cord is apt to be situated close by it, and remain there without much pressure. Such cases should be narrowly watched, and when pressure becomes evident, if such should be the case, delivery by the forceps is the right practice. Not unfrequently such cases are managed by nature safely. If the cord precede the breech there will not be any use of interference should the cord be between the legs, which it is generally, until pressure begins to intercept the circulation, which is not often the case. If the cord is pressed in this condition, we may facilitate the delivery by the fingers in the bed of the thighs, as in difficult breech presentations. If the feet and cord present, the cord will not often be badly affected by its prolapsed position; but if it is, the delivery may be accelerated by acting upon the feet. With the shoulder, back, or other part that renders the labor impracticable, turning on that account will be necessary, and the prolapse of the cord can scarcely be considered an important complication. Turning for prolapse of the funis alone will seldom, if ever, be required, and, I think, ought not to be considered a remedial measure for it. We need not interfere in any way if the child is dead.

PUERPERAL CONVULSIONS.

All convulsions occurring during the latter months of pregnancy, labor, and the puerperal state, are not necessarily puerperal convulsions, no more than intermittent fever, occurring under the same circumstances, can be called puerperal fever. Any kind of convulsive movements to which women are subject may occur at these times; but two or three kinds are observed more frequently than others, viz., hysterical, choreal, and epileptic. Some authors speak of the hysterical form of puerperal convulsions, but I think the term highly objectionable in such a connection. When hysteria does occur in pregnancy or parturition it is attended with all its characteristics, is of no more importance than at other times, and as a complication is simply embarrassing, more dangerous, and is amenable to the remedies that usually cure it. The same may be said of choreal convulsions or contractions, for they are not convulsions. Epilepsy is, of course, not a frequent accompaniment of these conditions, but is of more importance, because the convulsions are identical in form with the eclampsia parturientium, and will nearly always give rise to much anxiety. In addition, however, to the want of the premonitory symptoms of puerperal convulsions, the patient is known to be an epileptic, the paroxysms do not occur with the frequency of the eclamptic spasms. They are of no special importance as complicating pregnancy or labor, and, consequently, when the diagnosis is clear, need give rise to no uneasiness. These three, and other forms of convulsions that occasionally occur at such times, are not related in any respect, either in etiology, pathology, or therapeutics, with puerperal convulsions. The proper puerperal convulsions are peculiar in their etiology and pathology, not being identical with those attendant upon Bright's disease, although they more nearly resemble them in pathology than any other disease.

Eclampsia puerperalis is the result of cerebro-spinal hyperæmia, gravid, parturient, or puerperal condition of the genital apparatus, and uræmia. I think I am borne out in this manner of giving the etiological definition of the disease by the general opinion of the profession. In speaking of the changes brought about by pregnancy, I have endeavored to give the effect of pressure upon the vessels in causing hyperæmia of the head, spine, and kidneys, with some of the symptoms of the former. I also stated the effects upon the composition of the urine, in consequence of the retention in the blood of urea or its elements, and effusion of the abdomen through the capillaries of the renal vessels. I need not repeat this. I shall only say here that the blood is surcharged with urea and its elements; that this substance or the carb. ammonia, into which Frerichs thinks it changes, in circulating through the nervous centres, renders them more excitable and more easily influenced by other etiological circumstances. This excitability is greatly increased by their hyperæmic condition. It is also probable that the blood is still more vitiated by the retention of excrementitious material that is ordinarily eliminated in a more free state of the abdominal circulation. However this last may be, the quality and distribution of the blood both favor convulsive excitement in the nervous centres. The excito-motor or reflex influence of the genital organs in a gravid or parturient state seems to be powerfully causative of these convulsions. We often see these convulsions begin apparently as the effect of labor-pains, as the effect of obstetrical operations, and even after-pains. It is true also that other circumstances may be the exciting causes of convulsions: great mental emotions, affectional excitement, and many other causes of excitement. I know that it has been the opinion of some quite able authors, that the centric hyperæmia constituted sufficient predisposing cause of puerperal convulsion, and that labor and other powerful excito-motor circumstances were only necessary to induce an attack of puerperal convulsion. It is possible such may occasionally be the case, but I think it is far from being the rule, and a very rare exception.

The morbid anatomy of puerperal convulsions is constant only in the changes that occur in the kidneys. They are hyperæmic or congested, sometimes inflamed, scarcely ever any structural changes, unless when complicated with Bright's disease. Dr. Elliot gives a number of cases in his excellent work—Clinical Obstetrics—in which there was complication with Bright's disease, and recognizes the distinction between the anatomical changes in the two affections. A hyperæmic condition of the kidneys is quite a constant anatomical condition. Hyperæmia, congestions, effusion, serous or sanguineous, are the most common changes observable in the brain and spinal cord in post-mortem examinations; but often they are entirely wanting, these organs presenting a perfectly healthy appearance. The lungs are also occasionally, though not constantly, engorged. Notwithstanding, in many instances, the entire absence of anatomical changes in the vital organs, a close observer of the manner of dying will arrive at the conclusion that the vitality of the brain is somehow overwhelmed; that death begins at the brain in most cases; and in some the lungs are overwhelmed with mucous effusion in the air-cells and minute bronchi. The brain may cease to act because the blood is too vitiated to sustain its function, the same, only from different matter, as in asphyxia from poisonous gases. As an effect the lungs are filled up because of failure in innervation instead of congestion.

Symptoms and time of occurrence.—Puerperal convulsions occur during the latter month of pregnancy, seldom before the eighth month, quite often about the end of the eighth month, during labor, more frequently in first stage, before liquor amnii is evacuated and dilatation is complete, or after labor is over. From a few moments to several days after labor, the premonitory symptoms are such as denote imperfect excretion of urea, as œdema, scanty and high-colored urine, pain and heaviness in the region of the kidneys, and symptoms denoting cerebro-spinal disturbance: as imperfect and interrupted sleep, headache, vertigo, tinnitus, imperfect or irregular vision, bright spots before the eyes or other visual derangements, great nervous excitability, and mental and moral irregularities. These symptoms are likely to show themselves several days and even weeks before the attack of convulsion takes place; and it is a matter of much importance to determine the diagnosis of this predisposition. This is done with more certainty—in addition to observing the symptoms above described—by examining the urine. A careful chemical and microscopic examination of it should be made. Albumen will be detected, and there will be an absence or a scantiness of urea, while, with the aid of the microscope, we may detect tube casts quite constantly, and often altered blood corpuscles. When these symptoms and these conditions of the urine are detected in the latter months of pregnancy, the patient is predisposed to and in danger of puerperal eclampsia. While this is the case, she may pass through the remainder of gestation, labor, and the puerperal state without having convulsions.

The paroxysm is often preceded by some phenomenon of terrible significance, as incoherency of mind, deafness, blindness, or perverted sensation of some other kind, as loud noises, bright lights, etc.; or it is sometimes sudden and unheralded in its attack, the patient becoming unconscious suddenly, the face begins to be distorted, the mouth and eyes open widely, the tongue is protruded, the arms are drawn forcibly against the chest and bent upon themselves, the spine, from the occiput to the sacrum, is rigidly fixed and generally drawn backward, the muscles of the chest are rigid, and the walls of the thorax are held immovable, while the legs and feet are extended to their utmost, and held tense and hard. This universal tension remains for an uncertain length of time, seldom more than sixty or eighty seconds, and generally a shorter time. Generally during this universal contraction of the external muscles the diaphragm is also contracted, and occasionally the intestinal and vesical fibres contract and expel the contents of the bowels and bladder. After a greater or less length of time there is an alternation of contraction and relaxation of the muscles, and the face is contorted in various ways; the jaws are closed and the tongue is drawn into the mouth, but generally not until severely bitten by the closing teeth; the limbs are more or less extended and again immediately contracted, throwing the person about and contorting the body. This motion is sometimes so great as to throw the patient out of bed, but generally it is not enough to move the patient to any great distance. This convulsive twitching continues for a short but uncertain time and slowly subsides, leaving the whole body in a state of absolute relaxation. The muscles about the throat are relaxed, and even those of the mouth and tongue, so that each effort at inspiration draws the velum, tongue, and uvula toward the glottis, and partially impedes the ingress of air, giving rise to loud stertor and hissing. After a time the muscles regain their tonicity, the breathing becomes natural, the limbs firm, and the patient begins to move about, and opens her eyes in an inquisitive bewilderment, having been entirely unconscious during the whole of the paroxysm, and generally wonders what has happened. Another set of phenomena, indicative of the consequences of violent muscular contraction during the convulsion, is observable. The face becomes turgid; so is the scalp; the redness extends up into the hairy portion of the head; the eyes seem to start from the socket, and are distended to their utmost extent, becoming almost luminous and startling with their fixedness, and the neck and breast are suffused with a crimson flush. This redness of the surface becomes deeper until it is first bluish, next purple, and finally almost black. This dark color is apt to be greatest in the first few paroxysms, and is deepest at the end of the stage of rigidity, when the color of the whole face and surface of the neck and chest is one of asphyxia. The staring, bright eyes, the turgid, swollen, black face, and contorted, twitching countenance, form a horrid picture, almost strong enough to haunt the inexperienced in his dreams. This is not merely a state of resemblance to, but it is actually, asphyxia. The muscles of the thorax in contracting fix the walls of that cavity in such a way that no air can enter the lungs, and oxygen is not supplied to the blood, while the violent muscular contraction is throwing quantities of effete material into that fluid, and using up the oxygen contained in it, thus rapidly deteriorating it, until the quality of the blood is such that it is unfit to sustain the nervous centres in their functions, or the muscles in their actions. This is the cause of the termination of the paroxysm. After the paroxysm and its effects have subsided, the patient remains cheerful, and perhaps converses with her friends, and possibly feels no approach of the convulsions for several hours, or it may be but a few minutes, when she is again seized with the same dreadful symptoms, and passes through all the phenomena above described. After the second paroxysm the stertor, hissing, and stupor last longer; sometimes the patient does not awake from this last until another convulsion seizes her; but generally she again becomes conscious, but seems not so bright as before. The inter-paroxysmal symptoms increase in intensity and duration after each repetition, the stupor lasts longer, the mind becomes turbid, and the patient seems as if stunned by some overwhelming accident. Soon she fails to arouse from the effects of the paroxysm, and she lies stupid, listless, and unconscious, incapable of arousing under any effort that can be made to awaken her. One paroxysm succeeds another in more or less rapid succession, until in one protracted struggle the patient expires; or there is a continuation of twitching and jerking not violent enough to be termed a general convulsion, but which embarrasses respiration, the patient breathing through an accumulation of mucus, which causes loud rhonchus and sibilus that may be heard some distance from the bed. Indeed, in most cases the accumulation of mucus in the bronchi is very considerable. Instead of thus pursuing the course described to a fatal termination, the paroxysms may become less severe and the intervals more protracted until they finally cease, when the patient sleeps for twenty-four, thirty-six, or more hours, and gradually awakens to consciousness and convalescence. Sometimes the patient has one or several violent paroxysms when they suddenly cease. However they may subside, they are generally succeeded by prolonged somnolence, and when the patient awakes she is entirely oblivious of the circumstances that have transpired since her seizure and perhaps a day or two before, and this time forever remains a blank period in her existence. The reader will not fail to notice in the above description of the phenomena of puerperal convulsion the increasing effects of each recurring paroxysm upon the nervous centres. The growing stupor after each convulsion, its increased duration and intensity, until, after a number of them, it becomes profound and continuous, indicates plainly the influence exerted upon the circulation of the brain. At first the intellect is perfectly clear, and although consciousness is interrupted during the first paroxysm, it soon becomes obscured, until finally it is entirely obliterated. The two circumstances, viz., the *supervention* of stupor and obliteration of the mental faculties, show the effects produced upon the brain by the convulsion, and I think conclusively demonstrate that the morbid congestions and effusions sometimes found are not the cause but the effects of the convulsion. Another fact supporting this view is the paralysis, more or less complete, of the respiratory nerves, manifested by the accumulating mucus in the tubes and air-cells of the lungs. The pulse, at the commencement of an attack of puerperal convulsions, is more frequently corded and frequent, but sometimes entirely natural in all its qualities; as the disease advances it becomes more and more frequent and weak until it is very rapid. It is very difficult to examine during a paroxysm, but generally it is more rapid before the convulsion than after. Indeed, it is quite common to find it slow and full after the first two or three paroxysms, gradually increasing in rapidity until the supervention of the next. As before stated, however, the pulse becomes more frequent the more numerous the convulsive attacks.

Prognosis.—Puerperal convulsions is a very fatal disease. Perhaps, as stated by Prof. Carl Braun, of Vienna, the fatality to the mother will average thirty per cent. It is more fatal to the fœtus than the woman when it comes on before delivery. It is more dangerous when it occurs before than during labor, and less so after labor has been completed. There are three symptoms that indicate great danger in any given case—profound coma, rapid pulse, and embarrassed respiration. If the coma is not considerable, even though the pulse be rapid, the prognosis is less unfavorable; and if the breathing continues good, we may entertain hope. In fact, clear and perfect respiration is one of the most encouraging symptoms, and there are very few patients die in whom respiration is not embarrassed.

Treatment.—As we may often anticipate an attack of puerperal convulsions, the treatment of the premonitory condition becomes a subject of much importance. The condition of the blood may be very much improved by proper treatment. The bowels should be kept open, I think preferably by the bitart. potassa in sufficient doses, once a day, at bed-time, or the citrate of magnesia, or some other of the acid salts. The object in using the saline cathartics is to cause watery stools, and the acid in them may, to some extent, neutralize the bicarb. of ammonia. Acidulated baths and drinks have a good effect, and act in the same manner to some extent. But a remedy that I regard as invaluable in such cases is colchicum. The patient should take colchicum every day, in as full doses as she is able to bear. This remedy should be given perseveringly. It acts probably by increasing the excretion of urea by the kidneys; however this may be, I think I have seen the best effects result from its use. A case recently occurred in the practice of my colleague, Prof. Roler, in whom œdema and albuminuria persisted for several weeks before confinement, that was carried safely through, mainly I think by the colchicum. When there is evident and troublesome hyperæmia of the head, as evinced by flushed face, headaches, vertigo, or perverted sensation, especially if there is a full slow pulse, much good will be done by blood-letting, active exercise, and abstemious living. The skin should be kept warm and perspiring; if in winter, by warm clothing instead of warm rooms. When there is much nervous suffering this should be soothed by the bromide of potassium, Indian hemp, hyosciamus, the ethers, and chloroform administered internally. Opium is not generally well borne or profitable in such cases. When the nervous excitement is considerable the tinct. of calabar bean, in doses of from twenty to thirty drops, is indicated and may be expected to be beneficial.

During a paroxysm.—The clothing of the patient should be loose and light, a single gown, loose about the neck and large sleeves, is all, and perhaps the best, clothing the patient can wear; the bed should be large, and drawn to the middle of the room, so that the attendants can pass freely around it; and there should be plenty of fresh air, and no more people in the room than are necessary to render needful service to the patient. The patient should be placed in such a position as not to need restraint, on the back, near the middle of the bed. We should not permit any part of the person of the patient to be confined; the movements of the limbs should be free entirely; no restraint but such as is necessary to keep her from falling off the bed. When the patient is recumbent on the back in the middle of the bed, there is scarcely a possibility of injuring herself, but she may be bruised and otherwise injured by endeavoring to keep her still. Only one movement should be in any way controlled, and that is the closure of the jaws. Soon as the mouth is thrown wide open, and the tongue thrust out, a soft piece of pine wood should be placed between the teeth—perhaps a piece of india rubber would answer as well—and kept there until the convulsion is over. This prevents the jaws from closing on and wounding the tongue. As the paroxysm passes off, the frothy mucus that obstructs the nostrils and mouth should be wiped away, and the face sponged with cool water.

Treatment between paroxysms.—It is a matter of the first importance to prevent the recurrence of the convulsions, as they undoubtedly do great damage each time they occur, and of two with the same amount of toxæmia and hyperæmia, the one in whom the paroxysms are interrupted early stands much the best chance of recovery. Promptitude and thoroughness, if not energy, in the treatment, are of the first consideration in puerperal convulsions. And there is probably no means so available and manageable, and at the same time likely to be certain in effect, as the inhalation of chloroform. This anæsthetic may be so managed, if commenced with early, as to very generally prevent the return of the convulsion. But to do so, the patient must be kept under its influence *all the time.* We cannot anticipate a return of the paroxysm after the premonitory, or rather initiatory symptoms appear. It will then be too late. And it is certainly irrational to hold the chloroform to the nose of a patient already asphyxiated by a paroxysm. It is not right, therefore, to wait for initiatory symptoms, and it is wrong to give it while the convulsion is in existence. The patient cannot breathe it. But, by keeping up an influence for several hours, we may often interrupt the return of the convulsions. The usefulness of chloroform is confined to the early stages of the disease. After coma, stertor, and difficult respiration become great, there can be no good follow its use. It is also not advisable when the pulse is very rapid and feeble. There are two other important indications besides the prevention of the paroxysms. The first is to reduce cerebral hyperæmia, the second to eliminate the poison from the blood. If there are evidences of cerebral hyperæmia, such as flushed and turgid face, slow, strong pulse and headache, or hebetude of mind, early in the disease, we should bleed. Venesection perhaps is the best method of bleeding. She should be raised to the sitting posture, a large opening made in one of the veins of the arm, and the blood allowed to flow until there is an approach to syncope.

It will generally require a large amount, say twenty or thirty ounces, in patients full of blood and robust, while in the more delicate half the quantity will produce quite as much effect, and by raising the patient may bring about the greatest result from the smallest amount. Should the convulsion not be controlled, a second depletion of this kind will depend upon the pulse. I remember well the first case I ever had, twenty-nine years ago. The patient was a robust German woman, twenty-two years of age, about the end of the eighth month. She had had convulsions for six hours, one every forty minutes; the pulse was full and strong, and the face turgid. She was raised and held in the sitting posture and bled from both arms, until the pulse became rapid and weak, and the face pale. In two hours she was bled again, in consequence of a return of the paroxysm. The other treatment consisted in Croton oil purgative, and tartar emetic in small doses. The convulsions were interrupted, and the patient, after having gone the full term, was delivered of a fœtus that had doubtless been dead four weeks. If the patient is feeble and the pulse weak and rapid, it will be better not to bleed, but trust to other remedies. Cold to the head in ice-bags should be used, so as to keep the head cool. In fact, I am inclined to believe that the colder the temperature of the head, so that the scalp is not frozen, the better. It may be made very decidedly to allay the irritability of the brain. The same thing can be done by ice-bags to the spine, especially the upper part of it. I am also strongly of the opinion that brisk and copious catharsis is one of the most efficacious remedies, and have been in the habit of giving an emulsion of Croton oil until free evacuations follow. The vin. colchici, in drachm doses every four hours, is also an important means of medication, on account of its revulsive, diuretic, and diaphoretic effects. It will generally be borne in these doses, but sometimes the emesis and catharsis resulting from it will demand a decrease of dose. A hot foot-bath with mustard in it is also indicated, and often does a great deal of good. After the effects of cathartics have been decided and sufficient, the convulsions will be very much and beneficially affected by opium or some of its preparations, in full doses, unless coma and mucous effusion in the lungs are strongly marked symptoms.

If the convulsions occur during the progress of gestation, and there are no symptoms of labor, are we justifiable in inducing premature labor? I think not, because an average number of these cases recover with medical interference alone, and after the end of the eighth month the pressure upon the renal vessels is no longer increasing, but rather diminishing, by the development of the cervix, allowing the contents of the uterus to settle somewhat lower in the abdominal and pelvic cavities, and the induction of premature labor before the uterine cervix is completed must cause great nervous excitement. If, however, nature initiates this process, the indication to aid her becomes clear and we should act upon it. The os and cervix may be dilated by Barnes' dilators, until the fœtus descends within reach of the forceps. I have several times effected this dilatation with my fingers, and do not hesitate to believe it to be an excellent plan. During all operative procedures the patient must be kept profoundly under the influence of chloroform, so as to neutralize the nervous irritation caused by the operation. When the patient is already at term and in labor, we should encourage the expulsion of the fœtus when it is going on well, or when tardy we may and ought to accelerate it as much as we can. If labor has not begun, although the end of gestation is at hand, we are not justifiable in initiating that function. Our duties will terminate in every effort to cure the convulsions without obstetrical interference. Turning in order to accelerate delivery should not be attempted unless some circumstance attend that in itself requires this operation. Neither ought we to perform craniotomy to hasten delivery, without this is demanded by other considerations. After the convulsions subside, our patient will remain comatose and very much prostrated; usually the only treatment necessary to enable them satisfactorily to recover from this condition is the injunction of quietude, light diet, and a soluble state of the bowels. But occasionally the damage done to the brain is so great that mania of a longer or shorter duration exists, and will require alteratives, derivatives, and quiet. Or there may be, as I have known in two instances, slight paralysis, that is caused by congestion and effusion in the brain, which will demand the usual remedies for such states of the nervous system under other circumstances. Congestion of the lungs or passive sort of pneumonia will occasionally require special attention, as blisters, alteratives, expectorants, and anodynes. Finally, the various forms of puerperal, abdominal, and pelvic inflammation and fevers are observed to follow the puerperal convulsion and to require energetic treatment to arrest them. We are to expect and vigilantly guard our patient against all of these formidable consequences of puerperal convulsions.

The reader is referred for a fuller consideration of the theories connected with this affection to Medicine and Surgery of Women.

THE END.

INDEX.

- Abdomen, abnormal enlargement of, in the fœtus, 302
  - changes in size, shape, and consistence during pregnancy, 102
  - muscles of the, 8
  - palpation and percussion of, to determine pregnancy, 106
- Abdominal pregnancy, 135
  - souffle, 115
- Abortion, causes of, 155
  - diagnosis, 164
  - effects, 166
  - prognosis, 165
  - symptoms, 161
  - treatment, 167
- Abrasion of the nipple, 258, 270
- Abscess, milk, 258, 272
  - glandular, 261
  - treatment of milk abscess, 272, 278
- Acute diseases, treatment of, in pregnancy, 129
- After-pains, 248
- Air-bag, gum-elastic, 172
- Allantois, the, 78
- Amnion, development of the, 78
  - formation, 76
  - location, 85
- Anæsthetics, effects of, in labor, 231
  - method of administering, 232
- Anatomy of the female organs of generation, 25
  - fœtus, 93
- Anatomy of the funis, 88
  - nipple, 265
  - ovaria, 42
  - pelvis, 1
  - placenta, 86
  - uterus, 32
- Anodynes, in pregnancy, 134
- Apnœa in the new-born child, 240.
- Appetite, depraved, a symptom of pregnancy, 100.
- Arteries of the uterus, how compressed by uterine contractions, 390
- Artificial respiration, various methods described, 243
- Asthenia, treatment of, in the child, 242
- Astringents, use of, for promoting coagulation of the blood, 387
  - in ulceration of the nipple, 271
- Atony, symptoms of uterine, 417
- Auscultation, to determine the presence of the fœtus in utero, 112
  - a valuable method of determining position and number of fœti, 214

- Ballottement, a means of determining the presence of the fœtus, 111
- Barnes, Dr., his dilators, 374
- Binder, the best, for first application, 227
- Bladder, paralysis of the, 371
  - rupture, 431

Blastoderm, formation of the, 75
Blisters, to be used with caution in pregnancy, 133
Blood, the, great change in its condition after delivery, 245
Bodies of Rosenmüller, the, 38
Bones of the pelvis, 1
Breasts, acute inflammation of the glands, 276.
  causes of mammary inflammation, 263
  changes produced by pregnancy in, 101
  inflammation of the nipple, 256
  management of the, 255
  milk abscess, 258
Brain, congestion of, in the new-born child, 240
Breech presentations, 199
  management of, 228
  use of the forceps in, 327
Brow presentations, 230

Cæsarean section, general remarks on, 377
  indications for, 378
  operation described, 380
  statistics, 379
Carcinomatous disease of the uterus, 294
Carunculæ myrtiformes, 29
Cathartics, their use in pregnancy, 132
Causes of difficult labors, 279
  extra-uterine gestation, 139
  inversion of the uterus, 422
  mammary inflammation, 263
  prolapse of the cord, 432
Cephalotribe, the, 344
  its application, 346
Cervix uteri, changes induced in it by pregnancy, 57
  polypous growths in the, 291
Chamberlen's forceps, described, 313
Child, management of the cord in the new-born, 239
Child, nothing to be given but the breast, 238
  treatment of still-born, 240
  washing and dressing, 236
Chloroform, method of administering, 232
  remarks on its use, 231
Chorion, the, or vitelline membrane, 78, 85
Clitoris, the, 27
  its vascular apparatus, 28
Colpeurynter, or gum-elastic bag, 388
Conception, false, 145
  process of, 52
Congestion of the brain in the new-born child, 240
Convulsions, puerperal, 438
  prognosis and treatment of, 444
  symptoms and time of occurrence, 439
Cord, anatomy of the, 88
  ligation, 224
  management of, in the new-born child, 239
  prolapse, 432
  souffle, 115
Corpus luteum, 48
  spongiosum, 28
Cranioclast, Dr. Simpson's, 343
Craniotomy, instruments employed in, 338
  when to be resorted to, etc., 345
Crotchet, the, 338

Decapitation, method of performing, 347
  rarely practised, 347
Deciduous membrane, a means of communication between the mother and fœtus, 84
Deformity of the pelvis, a cause of difficult labor, 285
Delivery, changes in the condition of the patient after, 245

Delivery, difficulties requiring instrumental, 305
treatment after, 250
Depraved appetite a symptom of pregnancy, 100
Diagnosis of abortion, 164
blighted ova, 147
extra-uterine gestation, 139
face presentations, 212
labor, 203
missed labor, 145
placenta prævia, 397
preternatural presentations, 351
prolapse of the cord, 434
retroversion, 152
third stage of labor, 214
Diet of the lying-in woman, how to be regulated, 252
Dilators, Dr. Barnes's, 374
Diseases, acute, treatment of, in pregnancy, 129
Diuretics, use of, in pregnancy, 132
Douche, the, best way of using, 375
Duration of labor, considerations affecting the, 215

Ear presentations, 230
Eclampsia puerperalis, 439
Elliot, Dr. George T., his forceps described, 313
Embryonic spot, the, 75
Embryotomy, remarks on, 335
when justifiable, 336
Emetics, use of, in pregnancy, 132
Epidemics, comparative immunity from, in pregnancy, 124
Ergot, cautions as to its use, 376
dose and effects, 283
in difficult labor, 282
Ether, sulphuric, its administration in labor, 231
Evans, Dr., his obstetric extractor described, 329
Extra-uterine pregnancy, 135
Extra-ventral pregnancy, 143
Face presentations, 195 *et seq.*
diagnosis of, 212
management, 227
use of the forceps in, 327
Fæces, impacted, a cause of difficult labor, 292
Fallopian tubes, the, 37
False conception, 145
Feet-presentations, 199
how managed, 228
Female organs of generation, anatomy of the, 25
Fever, milk, 255
Fevers, as influenced by pregnancy, 128
Fillet, the, its use, 333
Fœtal head, the, 10
measurement in different directions, 12
sutures, 11
Fœtal heart, sounds of the, 113
Fœtus, anatomical peculiarities of the, 93
first movements, 108
head of, arrested by impaction, 309
modes of growth and development, 90
various movements, 110
Footling presentations, use of the forceps in, 327
Forceps, the, its application in various positions of the head, 321–326
its application in breech or footling cases, 327
its application in face presentations, 327
general review of operations with, 328
the placenta, 176
precautions to be observed in using, 329
proper form and construction, 315
when and how to be applied, 316 *et seq.*

Fourchette, the, 26
Funis, anatomy of the, 88
    ligation, 224
    prolapse, 432
    result of 15 cases in which it was left untied, 225

Gastrotomy, indications for, 378
    operation described, 380
    remarks on, 377
    statistics, 379
Generation, anatomy of the female organs of, 25
Gestation, causes of, 139
    duration, 118
    extra-uterine, 135
    prognosis and diagnosis, 139
    treatment, 141
Glands of the breast, acute inflammation of the, 276
    Naboth, 39
Glandular abscess of the mamma, 261
Graafian vesicles, 43
Greenhalgh, Dr., his views on the induction of premature labor in placenta prævia, 402
    case, reported by, 408
Gum-elastic air-bag, 172
    bag, or colpeurynter, 388

Hall, Dr. Marshall, his method of artificial respiration, 244
Hand presentations, 230
Head, the fœtal, 10
    method of perforating, 340
    presentation, 184, 192 *et seq.*
Heart, fœtal, sounds of the, 113
Hemorrhage, a complication of labor, 383
    accidental, before labor, 393
    after delivery of the placenta, 416
    after expulsion of fœtus, 411
    concealed, 385
    general symptoms of, 384
Hemorrhage, prognosis and treatment, 394, 414
    unavoidable, 395
    uterine, treatment of, 386
    various methods of arresting, 171
Hernial pregnancy, 143
Hodges' forceps, 314
Hook, the sharp and blunt, 338
    mode of using, 341
Hour-glass contraction of the uterus, 412
Hydatids, 146
Hydrocephalus, intra-uterine, 301
Hymen, the, 27
Hysterotomy per vaginam, 383

Impacted head, mischief caused by, 309
Inflammation, acute, of the glands of the breast, 276
    of the nipple, 256
    causes, 263
    prophylactic, palliative, and curative treatment, 265
Instrumental delivery, difficulties requiring, 305
    indications for, 306
    position of the patient in, 318
    labors, general management of, 367
Inversion of the uterus complicating labor, 420
    causes, 422
    prognosis and treatment, 424
    symptoms, 423

Kellar, Dr. M. B., his report of 15 cases in which the funis was left untied, 225
Knee presentations, 199
    management of, 228
Kyestine, presence of, in the urine a symptom of pregnancy, 102

Labia majora, 26
  minora, 27
Labor, natural, described, 176
    causes which determine its commencement, 177
    diagnosis, 203
    duration dependent on many considerations, 215
    mechanism of, 182
    pains simulating, 206
    prognosis connected with, 215
    symptoms of its approach, 178
    the three stages described, 179
    management in the first stage, 220
    management in the second stage, 222
    management in the third stage, 225
    diagnosis in the third stage, 214
    in multiple cases, 235
    anæsthetics in, 231
    great change in the condition of the patient after its accomplishment, 245
  complicated by inversion of the uterus, 420
  difficult, 279, 305, 383
    common causes of, 280
    treatment, 282
  missed, 144
  premature, induction of, 372
    mode of operating, 373
    induction of, in placenta prævia, 402
    statistics, 404
Labor-pains, inefficient, 280
Labors, general management of tedious and instrumental, 367
Labors, effects of difficult, 368
  preternatural, 349
  treatment of difficult, 368
Legroux, M., his ingenious contrivance for protecting the nipple, 268
Lever, the, 333
  in retention of the head after delivery of the body, 334
Ligaments of the uterus, 33
Ligation of the cord, 224
Liquor amnii, 86
Lochial discharge, the, 248
  treatment when suppressed, 254

Malacosteon, a cause of distortion of the pelvis, 288
Mamma, causes of inflammation in the, 263
  glandular abscess, 261
Mastitis, 261
Membrane, deciduous, a means of communication between the mother and fœtus, 84
Membranes, abnormal condition of the, a cause of difficult labor, 300
Menses, irregularities of the, 96
  suppression usually the first symptom of pregnancy, 96
Menstruation, contemporaneous with ovulation, 50
  normal and abnormal, 50
Milk abscess, 258, 272, 278
  fever, 255
Miscarriage. See Abortion
Missed labor, 144
Mons veneris, the, 25
Monsters, various, described, 302
Morning sickness, 97
  remedies, 98
Multiple cases, natural labor in, 236
  pregnancy, 119
Muscles of the pelvis, 8

Naboth, glands of, 39
Nævi, or mother's marks, 100
Nausea in pregnancy, 97

Nausea in pregnancy, remedies, 98
Nervous irritability diminished during pregnancy, 127
Nipple, anatomical peculiarities of the, 265
  flat and deficient, how treated, 273
  inflammation, causes of, 263
  prophylactic, palliative, and curative treatment of inflammation, 265

Obliquities of the uterus, 297
  treatment, 198
Obstetric extractor, Dr. Evans', described, 329
  position, 222
Ointment for sore nipples, 270
Opium the best anodyne in pregnancy, 134
Os uteri, carcinomatous disease of the, 294
  diverse conditions of rigidity, 373
  methods of dilating, 373
Ova, blighted, 145
Ovaria, anatomy of the, 42
Ovarian pregnancy, 135. See Gestation.
  tumors, 290
Ovaro-tubal pregnancy, 135
Oviduct, the, 37
Ovisacs, anatomy of the, 44
Ovulation, process of, 45
Ovum, changes in the, after ejection from the ovisac, 72
  description of the, 45
  first arrival in the uterine cavity, 60
  hydatidiform, 146

Pacini, his method of artificial respiration, 244
Pains simulating labor, 206
Paralysis of the bladder, 271
Passive motion, or ballottement, 111
Pathology of pregnancy, 124
Patient, position of the, in instrumental delivery, 318
Pelvimeter, description of the, and manner of using, 14
  the author's, 19
  Van Heuval's, 14
Pelvis, anatomy of the, 1
  deformity of, a cause of difficult labor, 285
  simplest means for measuring, 13
  tumors of, 288
  turning in contracted, 348
  varieties of distortion, 287
Perforator, the, 338
  how used, 338
  Smellie's scissors, 338
Perinæum, rigidity of the, a cause of difficult labor, 295
  three varieties of rupture of, 232
Phthisis pulmonalis, often influenced by pregnancy, 127
Placenta, anatomy of the, 86
  expulsion of, 226
  functions, 89
  hemorrhage after delivery of, 416
  retention of, 413
Placenta prævia, 395
  diagnosis and prognosis, 397
  treatment, 398
  turning in, 400
Placental souffle, 115
Plug, vaginal, the author's, construction and use, 405
Pneumatic tractor, the, 334
Polypous growths of the cervix uteri, 291,
Post partum hemorrhage, 411
  treatment, 414, 416
Pregnancy, changes in the maternal organs induced by, 54
  duration of, 118
  general pathology and therapeutics, 124
  mole, 145
  multiple, 119
  physical signs of, 104

Pregnancy, symptoms, 96,
  extra-uterine, 135
    causes, 139
    prognosis and diagnosis, 139,
    treatment, 141
  extra-ventral, 143
Premature labor, induction of, 372
    mode of operating, 373
    induction of, in placenta prævia, 402
    statistics, 404
    case reported, 408
Presentations, breech, knee, and feet, 199 *et seq.*, 228
    ear and brow, 230
    face, 195 *et seq.*, 212, 227
    head and hand, 230
    head with the cord in advance, 433
    placental, 395
    preternatural, render labor difficult, 349
    use of the forceps in face, breech, and footling, 327
    vertex, 184, 192 *et seq.*
Preternatural presentations, 349
    diagnosis, 351
    symptoms, 350
Prognosis of abortion, 165
    blighted ova, 148
    extra-uterine gestation, 139
    inversion of the uterus, 424
    multiple pregnancy, 121
    natural labor, 215
    placenta prævia, 397
    puerperal convulsions, 444
    retroversion, 153
Prolapse of the cord, 432
    causes, 432
    diagnosis and prognosis, 434
Prolapse, treatment, 435
  of the uterus, 149
    treatment, 150
Puerperal condition, management of, 249
    phenomena of the, 245
  convulsions, 438
    symptoms and time of occurrence, 439
    premonitory condition, 441
    prognosis and treatment, 444

Quickening, two different methods of its occurrence, 108
Quinine, its use in pregnancy, 133

Rachitis, 288
Respiration, artificial, various methods described, 243
Retroflexion of the uterus, 151
    treatment, 153
Retroversion of the uterus, 151
    treatment, 153
Rigidity of the os uteri, diverse conditions of, 292
    of the vagina and perinæum, 295
Rosenmüller, the bodies of, 38
Rupture of the bladder, 431
    perinæum, three varieties, 232
      sometimes cured spontaneously, 234
    uterus, 426
      diagnosis, 429
      symptoms, 428
      treatment, 430

Salivation, in pregnancy, 99
Secale cornutum, in difficult labor, 282
    dose, and effects, 283
Shields, various, for the nipple, 267, 274

Simpson, Dr., his cranioclast, 243
Smellie's scissors perforator, 338
Souffle of the cord, 115
  placental, uterine, or abdominal, 115
Spermatozoa, progressive development of the human, 53
Sponge, compressed, use of, for dilating the os uteri, 373
Spurious labor pains, 206
Spurred rye, in difficult labor, 282
  dose and effects, 283
Stethoscope, use of, in auscultation of the fœtus in utero, 112
Still-born child, treatment of, 240
Stomach, derangement of, a symptom of pregnancy, 97
Sulphuric ether, its administration in labor, 231
Superfœtation, 123
Sutures of the fœtal head, 11
Sylvester, Dr., his method of artificial respiration, 244
Symphyseotomy, 382
Symptoms of abortion, 161
  inversion of the uterus, 423
  pregnancy, 96
  preternatural presentations, 350
  puerperal convulsions, 440
  retroversion, 152
  rupture of the uterus, 428
  ulceration of the breast, 257

Tampon, various kinds of, 388
Therapeutics of pregnancy, 124
Thomas, Dr. T. G., his method of treating prolapsed cord, 435
Traction on the body of the child, excessive, to be avoided, 229
Tractor, the pneumatic, 334
Treatment of abortion, 167
  after delivery, 250
  blighted ova, 148
Treatment of difficult labors, 282
  extra-uterine gestation, 139
  inversion of the uterus, 424
  hemorrhage after delivery of the placenta, 418
  hemorrhage after expulsion of the fœtus, 414
  mammary inflammation, 265
  placenta prævia, 398
  prolapse of the cord, 435
    uterus, 150
  puerperal convulsions, 444
  retroversion, 153
  rupture of the bladder, 431
  uterine hæmorrhage, 386
Tubal pregnancy, 135
Tumors, bony, of the pelvis, 288
  fibroid, 291
  ovarian, 290
Turning in contracted pelvis, 348
  operation, 360 *et seq.*
  in placenta prævia, 400
  three general methods, 356

Ulceration of the nipple, 256
  treatment, 270
Umbilical vesicle, the, 78
Urine, changes in, in pregnant women, how detected, 103
Uterine atony, symptoms of, 417
  hemorrhage, treatment of, 386
  souffle, 115
Uterus, anatomy of the, 32
  arteries compressed by contractions of, 380
  changes in, caused by pregnancy, 54
  changes in its relations to other organs during pregnancy, 68
  changes in, after delivery, 246

Uterus, displacements of, during pregnancy, 149
  fibrous and glandular structure, 40
  hour-glass contraction, 412
  inflammation of, 370
  inversion of, complicating labor, 420
  lining membrane of, 38
  method of exciting its action, 376
  obliquities, 297
    treatment, 298
  prolapse, 149
  retroversion and retroflexion, 151
  rupture, 426
  tubular structure, 39

Vagina, anatomy of the, 30
Vagina, rigidity of, a cause of difficult labor, 295
Vaginal touch, determination of pregnancy by the, 104
Vaginitis, treatment of, 370
Van Heuval's pelvimeter, 14
Vectis, the, 333
  in retention of the head after delivery of the body, 334
Venesection, in pregnancy, 131
Veratrum viride, its use in pregnancy, 131
Version, or turning, 348, 355
  operation, 360 *et seq.*
  three general methods, 356
Vertex presentations, 184, 192 *et seq.*
Vesicle, the umbilical, 78
Vessels of the pelvis, 9
Vitelline nucleus, 72

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on or before the date last stamped below.

[illegible]

Mendocino

Cal

0124 Byford, W.H.
B99 Theory and practi
1870 of obstetrics. 329

NAME DATE DU

32985